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ORGANISATION OF THE AGRICULTURAL INDUSTRY.

The Provisional Council of Agriculture—A Record of Progress.

Laying the Foundations for State-wide Rural Co-operation.

Since its constitution in April last the Provisional Council of Agriculture has met on three occasions, and a brief summary of its activities and deliberations to date is set out hereunder.

1. Scheme for Organisation of the Agricultural Industry.

(*a*) *Queensland Producers' Association*—

The Council has adopted a scheme the outlines of which are as follows:—

i. That there shall be established an Association, to be known as the Queensland Producers' Association, which shall be open to Dairymen, Fruitgrowers, Wheatgrowers, Small Graziers, Canegrowers, Sugar Producers, and General Farmers.

ii. The Association shall consist of a Provisional Council of Agriculture District Councils, and Local Producers' Associations.

(*b*) *Provisional Council of Agriculture*—

i. That, pending the appointment of a Council of Agriculture, a Provisional Council shall be constituted, to consist of 22 members, comprised of the following:—

5 direct appointees of the Government,
5 Dairying representatives,
5 Fruitgrowers' representatives,
4 Sugar-growers' representatives, and
3 General agricultural representatives.

ii. That vacancies shall be filled by the appointment of another representative for the particular division in which the vacancy occurs.

iii. That further members may be appointed if deemed necessary by the Council.

iv. That, briefly, the objects of the Council shall be as follows:—

To generally co-operate with and assist District Councils and Local Producers' Associations;

To engage in research work and subjects relating to the rural industries, and secure effective action for the controlling of diseases and pests;

To secure additional markets and improve the means of transport and distribution of produce;

To standardise products and assist and advise the Department of Agriculture and other State Departments;

Generally, to investigate and deal with all problems relating to the rural industries.

v. That Standing Committees be appointed to report on or deal with any matters referred to them by the Council.

(*c*) *District Councils*—

i. That in each district determined by the Council of Agriculture a District Council shall be established;

ii. That pending the establishment of District Councils, the Governor in Council, upon the recommendation of the Council, may constitute provisional District Councils, the members of which shall also be appointed in the same manner. Provisional Councils so constituted shall in the ordinary course hold office for one year;

iii. Subject to the general control of the Council, the duties of the District Councils shall include consideration of schemes with regard to production, marketing, standardisation, and the making of more profitable use of the State experts and facilities generally of the Department of Agriculture to encourage co-operative buying and selling among the primary producers in the areas covered by them, and to promote such matters as herd testing, fodder conservation, and similar activities;

iv. To assist in every way possible the Local Producers' Associations within their areas;

v. Generally to discharge such duties and functions as the Council may determine.

(*d*) *Local Producers' Associations*—

i. Each sub-district may form a Local Producers' Association, which shall be open to all *bonâ fide* producers within the sub-district.

ii. Subject to the general control of the District Council and the supreme control of the Council of Agriculture, duties of Local Producers' Associations shall include taking the initiative in rural matters within the sub-districts; formulating schemes to meet the requirements of producers within the sub-districts; bringing before District Councils problems of any interest and concern; generally assisting and supporting District Councils in promoting the prosperity of primary producers.

2. Standing Rules and Orders.

The Council has adopted a number of standing rules to govern its general procedure at meetings and otherwise.

3. Director, Queensland Producers' Association.

Steps have been taken with the object of securing a Director to administer (subject to the control of the Council) the affairs of the Queensland Producers' Association. The term of the appointment has been fixed at three years, and applicants are required to possess expert business, financial, and organising qualifications. Applications have been invited through the public Press of Australasia, and the closing date has been fixed for the 30th June.

4. Delegates.

A number of delegates have been temporarily appointed to visit various centres and expound the new scheme. A large number of rural districts have already been visited, and reports to hand indicate that the scheme is meeting with the unanimous approval of producers.

5. Legislation.

Legislation with respect to the constitution of the Queensland Producers' Association will be submitted to Parliament during the coming session.

6. Provisional District Organisers.

Provisional District Organisers are to be appointed forthwith. Their duties will be to follow up the work of the delegates by systematically organising the respective districts to which they are appointed, and to generally assist in the formation of Local Producers' Associations and District Councils.

7. Amendment of Fruit Cases Act.

The Government is being requested to amend the Fruit Cases Act to provide for such alterations in standards as may be found necessary from time to time.

8. Banana, Citrus, and Pineapple Standards.

The Department of Agriculture has been requested to adopt certain standards relating to bananas, citrus fruits, and pineapples, approved at recent meetings of fruitgrowers in Southern Queensland.

9. Fruit Pools.

The Government is being requested to introduce legislation of a comprehensive character, framed to cover all sections of the fruitgrowing industry, and provide for ballots to be taken of all growers, prior to making any particular pool operative.

10. Fruit Instruction and Inspection.

The Department of Agriculture has been requested to arrange for more effective instruction and inspection with respect to the picking, grading, and packing of fruit products.

11. Utilising Surplus, Waste, and Inferior Fruits.

Steps have been taken to associate the Agricultural Chemist with the Standing Fruit Committee in fully investigating the possibilities of utilising surplus, waste, and inferior fruits and vegetables.

12. Standards of Containers.

Federal Authorities are being requested to consult the Council of Agriculture prior to making any departure from the present standards of containers in use in Queensland.

13. Transport Facilities in the Carriage of Fruit.

A number of suggestions brought forward by the Standing Fruit Committee for the purpose of improving the transport facilities in the carriage of fruit over the Queensland Railways, and reducing freights on fruit, have been recommended to the Transport Committee for favourable consideration.

14. Fruit Fly.

The New South Wales Department of Agriculture is being requested by the Queensland Authorities to inquire into the matter of fly-infested orchards in New South Wales adjacent to the Stanthorpe district, with the object of having the orchards in question either cleaned or destroyed.

15. Fruit Trees true to Type.

The Department of Agriculture has been requested to take steps to ensure that trees supplied to growers by nurserymen are true to type.

16. Sugar Agreement.

The Council has decided to take steps, through Local Producers' Associations and District Councils, to further by every means a continuance of the present Sugar Agreement.

17. Productivity of Sugar Lands and Utilisation of Waste Sugar Products.

The Council is of opinion that, in regard to the question of the improvement of the productivity of sugar lands and the utilisation of waste products, everything possible is now being done, but that new developments will be kept in view.

18. Wheatgrowing. Improving Cultural Methods.

The Council, in conjunction with the Department of Agriculture and the State Wheat Board, has succeeded in effecting a considerable improvement in the cultural methods of wheatgrowing in Queensland. The scheme prepared by the Council has been adopted by the Wheat Board. It provides for the purchase by the Wheat Board from the Department of Agriculture of a quantity of specially selected seed, which will be grown under special conditions. The wheat so harvested will, in turn, be reserved for seed purposes. A new list of recommended varieties has been drawn up, and these have been allotted to certain districts, where each will be planted on a specified class of soil.

19. Organisation of Maizegrowers.

With a view to organising maizegrowers, the Department of Agriculture, on the recommendation of the Council, is now arranging to collect from growers statistical and other information for the purpose of enabling it to prepare a concrete scheme for the betterment of the conditions of maizegrowers generally.

20. Bulletins.

The Council has decided that bulletins and other literature will be issued from time to time for the purpose of keeping producers fully advised of its various activities.

21. Loans to Farmers.

To further assist in the development of the State's agricultural resources, the Council has made recommendations to greatly extend the scope of operations of the existing Co-operative Agricultural Production and Advances to Farmers' Acts.

The proposed advances are wide in their scope, and are framed to meet the needs and requirements of new settlers who may be starting operations for the first time, or others whose holdings require developing.

The Council's recommendations are intended to assist in the purchase of dairy cattle; purchase of pigs; purchase of sheep; erection of silos; erection of hay-sheds and purchase of hay-making machinery; co-operative purchase of machinery to assist agricultural production; co-operative purchase of entires, bulls, rams, and boars; construction of grain storage silos, and sheds and accessories for the storage and handling of grain.

To improve the existing marketing system, advances have also been recommended to provide for the construction of grain storage silos, &c.

22. Herd-testing.

In recognising the importance of herd-testing, the Council has decided to circulate, through Local Producers' Associations and other bodies, full information relating to herd-testing methods and their advantages generally.

23. Fodder Conservation.

The Council is of opinion that the question of fodder conservation is one of extreme importance, and it has now under consideration a scheme in this connection.

24. Additional Entomologists.

The several Standing Committees had stressed the need for the appointment of additional Entomologists to study the pests affecting all branches of the primary industries, and the Council has decided to advocate close co-operation between the Department of Agriculture, the University of Queensland, and other interested bodies, with a view to arranging for the training of men on sound scientific lines who will be able to assist in discovering means to deal effectively with such pests.

DAIRY ADVISORY BOARD.

A RECORD OF ACTION AND ACHIEVEMENT.

A summary of the activities and deliberations of the Dairy Advisory Board is outlined hereunder:—

1. Transport.

(*a*) *Improved Service for Transit of Dairy Products over Queensland Railways.*

The Commissioner for Railways has been asked to increase the number, and effect an improvement in the design, of trucks utilised for the conveyance of dairy products, and also to see that cream is delivered by the first possible train to factories.

The Commissioner has expressed a desire to meet the Board to discuss these matters, and arrangements are now being made for the above meeting to be held on Wednesday, the 7th June.

(*b*) *Manufactured Dairy Produce.*

The Board was successful in inducing the Railway Authorities to make a 20 per cent. reduction in rail freights on manufactured dairy products from factories to markets.

(*c*) *Cream.*

A request for a similar reduction with regard to cream has also been successful.

(*d*) *Bacon Factory Products.*

Cabinet decided that a reduction in rail freights on bacon factory products could not be granted.

2. Cold Storage.

As a result of the representations of the Board, a section of the Government Cold Stores at Hamilton will probably be ready to receive dairy produce during the next export season.

3. Marketing and Distribution.

At the instigation of the Board, the Agent-General's Office in London will furnish the Board with a complete report on the conditions surrounding the handling, marketing, and distribution of Queensland dairy produce in London. Suggestions with regard to the improvement of such dairy produce, together with periodical reports on the market conditions, and quality of individual consignments arriving in England, will also be supplied.

4. Crating of Cheese for Export.

The Minister for Agriculture has approved of a recommendation of the Board that all cheese for export be crated at the factories. This will obviate injury in transit, and consequent depreciation of cheese hitherto sent loose by rail to Brisbane. The new decision will be given effect to as from the commencement of the next export season.

5. Herd Improvement.

(*a*) *Utilisation of Purebred Bulls.*

In this connection the Board has recommended the establishment of Government Stud Farms in suitable centres throughout the State, and also an increase in the numbers of purebred dairy stock at the Gatton Agricultural College.

(*b*) *Herd Book Societies' Rules.*

Resolutions have been carried by the Board with the object of effecting alterations in the existing rules of Herd Book Societies. The aim of these resolutions is

to obviate, as far as possible, fraudulent practices on the part of stud stockowners, and to ensure that only animals of the highest class secure final entry in the Herd Books after passing a prescribed butter-fat test.

These resolutions are being conveyed to breeders of purebred stock, who are being asked to nominate representatives with power to act, to meet the Board and fully discuss matters.

(*c*) *Herd-testing of Individual Herds.*

The Board has prepared certain printed matter which has been handed to the Council of Agriculture with the request that steps be taken to have the information circulated amongst dairymen.

6. Stabilisation of Prices.

Members of the Board have on two occasions visited the Southern States with the object of securing a stabilised price for dairy produce within the Commonwealth. Largely as a result of their efforts (the value of which has been fully recognised in the South) Conferences of Dairymen held in New South Wales and Victoria approved of the principle. These were followed by an all-Australian Conference representative of Dairying Interests, and the Board is convinced that there is every likelihood of early arrangements being made to adopt the principle of stabilisation, by fixing a price for dairy produce within the Commonwealth.

7. Conservation of Fodder.

The Board has given a good deal of consideration to this subject, and has forwarded to the Agricultural Council, for its consideration, a scheme dealing with the matter.

8. Dual Grading of Dairy Produce.

(*a*) For the information of the Minister of Agriculture, the Board expressed the opinion that the best interests of the producers of Australia would be served if the Commonwealth powers in relation to the grading and examination of dairy produce should be vested in the Department of Agriculture in the various States.

(*b*) That the grade marking of packages of dairy produce for export should be discontinued.

9. Pasteurisation.

In order to become conversant with the best methods of pasteurising milk and cream, efforts have been made to secure up-to-date information regarding the subject. As a result the Board is now in possession of a number of informative communications from New Zealand and elsewhere, which will be turned to useful account as occasion requires.

10. General Matters.

The value of a controlling body has been largely recognised by dairy farmers and factories, as a considerable number of requests for advice on a variety of subjects are received. In this way the Board has been able to lend a good deal of useful assistance to those engaged in the industry.

11. Amalgamation with Agricultural Council.

For some time members of both the Advisory Board and the Agricultural Council had been of opinion that too many dairying representatives were included on both bodies. At a Conference held in the Premier's Office on the 15th instant, members of both the Board and the Council were unanimous in a desire to have the matter settled, and the question of making a new selection to in future constitute the Dairying Section of the Agricultural Council was left in the hands of the Premier, the Minister for Agriculture, and the Chairman of the Administrative Committee of the Council. It was subsequently announced that six representatives had been selected, and these would in future sit as the Dairying Committee of the Agricultural Council.

PAPER MULCH FOR PINEAPPLE-GROWING.

From the "Agricultural Gazette of New South Wales" we take the following method of using paper mulch:—"The idea of a paper mulch for sugar-cane was patented some years ago, but no experiments with pineapples were conducted until 1919. It is estimated that there are now 461 acres planted in paper, of which 68 acres will fruit in 1922. The paper mulch appears to consist of a strip of paper in which are cut holes large enough for the pineapple plants to grow through. The first yields from the method were obtained last year (1921), and, according to the writer, Mr. A. T. Longley, at the annual meeting of the Hawaiian Pineapple Packers' Association, it was found that the plants in paper grew uniformly larger, greener, and more healthy, and the fruit larger (equal to a little over 3½ tons per acre) and better conditioned. The paper mulch prevents the growth of weeds and the packing of the soil under heavy rains, thus greatly reducing the cost of inter-cultivation. In an experiment at the Hawaiian Pineapple Association's Experiment Station the plant growth on paper mulch was three times greater in weight and much healthier than on other plots." The above answers our correspondent's question on the subject.

COFFEE-GROWING IN QUEENSLAND.

By A. J. BOYD.

When planting out the coffee seedlings, the main root (the tap-root) should stand straight in the hole prepared for it, for its whole length, and care should be taken that the roots are not tangled. When the plant is in position, the surrounding soil should be firmly pressed by hand. Another important matter is to see that the seedling is not planted deeper than it was in the seed-bed or flower-pot; otherwise the bark above the root will decay.

There is no part of the working of a coffee plantation which demands more supervision or greater care than the planting out, because carelessness in this work is not in immediate evidence, but may injuriously influence the thriving or weakness of the future tree. For this reason quick planting and cheap work are eventually dear, and only reliable white workers should be entrusted with this most important labour. It is true that young coffee plants are tough and resistant, but that should be no reason for mishandling them; wherefore the casual losses will be less and the duration of the plant's life longer in proportion to the care taken at the outset.

For the first few days, or even weeks, after planting out, the young trees should be protected from the full heat of the sun by leafy bushes or by a small board placed slantwise in the ground at a little distance from each tree. This may seem troublesome work, but it eventually pays. At intervals of three weeks, and, later, of six weeks, after planting, the young trees should be examined, and sickly or shrivelled ones replaced by healthy plants. It is needless to impress upon the young coffee-planter the necessity for keeping down weeds. For this purpose there are still some planters who prefer to use the old, out-of-date hand hoe of their ancestors, holding the belief that the use of horse-drawn implements is injurious to the trees; but common sense should teach the lesson that the most expensive work on the plantation is the result of the use of the hand hoe, whilst the most efficient work is that done by modern ploughs, cultivators, and harrows.

When the trees have reached the age of between 2 and 3 years, it is time to decide whether they should be topped or allowed to grow to their natural height. Both of these methods have their advantages and disadvantages, and that which may be advantageous in one district may not be suitable for another. There are three objects to be attained by topping and pruning, of which H. Semler, in his work on "Tropical Agriculture," says:—

"These are:—First, heavier bearing; secondly, facility of picking; and, thirdly, protection against high winds. As regards the first point—namely, heavier bearing—there is no doubt that by judicious topping and pruning the crop for the first year or for a series of years can be considerably increased. But experienced planters have, for some time, taken the view that the early increase in the yield of berry can only be obtained at the cost of shortening the life of the topped trees, or of the yield in later years, and that, eventually, when the returns for a series of years are taken into consideration, it is much more profitable not to top the trees."

The pruning of coffee trees is not much practised in South America, but is continued in Southern Asia, in which country not only larger crops were the result, but increased facility for gathering was obtained. Of late, however, even in the

latter country, the trees are allowed to grow freely and naturally, and the planters are quite satisfied with the results.

Notwithstanding this, if, where much topped and pruned coffee is seen, one asks for the planter's reason for this, he receives the reply:—"We would allow the whole of the trees to go untouched if sufficient labour were obtainable at picking time, but since that is often unattainable, and since the picking from untopped trees is more laborious and inconvenient than in the case of trees about 6 feet high, much of the coffee falls to the ground and is lost for want of labourers."

On the other hand, the topping and pruning also demand more labour, and this is done at a different time between the picking seasons, and then, by this arrangement, we manage a suitable distribution of work throughout the year.

In Ceylon, the trees were, and still are, kept to a very low growth. On most of the plantations the trees are topped to 1½ yards in height, and often, as I (the writer) saw during my two visits to Ceylon, to a height of 1¼ yards, and even 1 yard was common.

Having, then, decided on topping, and at what height, the planter must wait until the main stem has become brown and woody. There is no need for anxiety about the top, as a mistake is easily corrected. If, for example, it were cut off too high up, the main stem can be cut back at any time, and if too low down, on the other hand, a young shoot near the top can be allowed to grow near the main stem. After the topping, the main stem constantly sends out young shoots, and these must be rubbed off by hand shortly after they appear. When this has been done, the remaining branchlets should be paired; that is to say, one of the two opposite shoots near the top can be allowed to grow near the main stem, and then be cut off, changing from left to right and right to left, and all branchlets which cross each other must be cut off.

It is hardly worth adding that this theoretical work cannot be actually carried out in practice, and one must be content with some such approximate assistance to the main stem.

In the case of Liberian coffee, the methods here given—to keep the trees somewhat dwarfed—cannot be profitably adopted. The growth of the Liberian coffee tree is so vigorous that when it is attempted to keep it low by force, the result is a rich tangle of thriving branches and leaves, instead of a heavier crop of fruit.

Some years ago I grew a considerable number of coffee trees, some of which I topped, whilst others were allowed to carry on their natural growth. When the trees bore, I found that the topped trees bore earlier than the latter, but I cannot remember that there was any difference in the yield, which was very heavy. I had no means of pulping the berries, beyond crushing off the pulp in a gunny bag. The beans dried with the parchment skin were sent to a factory, where they went through the necessary process and returned to me in the shape of excellent coffee, which supplied the household wants for some time. I started a coffee plantation at Lawnton, on the Pine River, but constant dry weather had such a bad effect on all vegetation for a couple of years that I gave up the farm and never heard any more of my coffee trees, although, perhaps, some may still be living in the botanic gardens at Lawnton.

IMPROVING THE QUALITY OF COTTON AND THE INCREASE OF ITS YIELD.

COMPILED BY A. J. BOYD.

In view of the reported decrease in the quantity and quality of cotton grown in the United States of America and in Egypt, during the year 1919 and previous to that time, the Ministry of Agriculture of Egypt specially invited the Director of Agriculture in the United Provinces of India, Mr. Martin Leake, M.A., to visit Egypt to make recommendations for the improvement of the quality of the cottons grown in that country, and for increasing the yield. Mr. Leake accordingly paid two visits to Egypt, and furnished a report embodying many valuable suggestions to that end. His recommendations with regard to the cotton industry in Egypt are equally applicable to Queensland's conditions, especially his references to the necessity for raising pure seed. This is a most important matter in connection with cotton-growing in Australia to ensure good prices in the British cotton market. Although cotton has been grown in Queensland for many years, there has, in the past, been little attention paid to the raising of pure seed. Much of the cotton grown here was then raised from mixed seeds, with the result that the highest price

was not received for the ginned cotton exported to England, owing to its want of uniformity in length and the strength of the fibre. Mr. Leake said, in his report, that the cotton produced in Egypt is, and must continue to be, diverse, and the various classes required to be produced in quantities approximating to the relative demand. Market flexibility may enable new cottons to be absorbed at a high price up to a certain point, but it must not be overlooked that over-production of the high-priced cotton will reduce its price to such a level that it is not profitable to grow it. Distinction should be made between cottons with an intrinsic value and those with an artificial value.

Also, while diversity of class is required, uniformity within the class is essential.

The general opinion of Manchester is that the demand for goods manufactured from the higher grades of cottons, although at the present time mainly potential, is large enough to absorb at its full relative value as much of the long-staple cotton as Egypt is capable of producing. The area in that country suitable for the production of Sea Island cotton is very restricted, and Mr. Leake reasonably holds the opinion that there is every justification for attempting to develop in Egypt a cotton to take the place of Sea Island. He advises that measures should be taken to see that the two factors "price and yield" should be sensibly equal for all kinds grown, and he summarises these measures under the heads of Economic, Botanical, Agricultural, and Commercial.

1. The *Economic,* includes a knowledge of the normal relative requirements of the different classes of cotton, and their normal relative price is essential. Accurate information is also necessary as to the developments taking place in other countries, which are liable to upset the balance.

2. The *Botanical.*—The main lines of work are—

(*a*) Selection, with a view to the isolation and maintenance of pure strains of the existent standard cottons, and also to the discovery of new types;

(*b*) Hybridisation, which may be looked upon as a *direct* method of evolving new and improved types; and

(*c*) Physiological investigation, which is concerned with discovering the exact relationship between the plant and its environment, so that the latter may be controlled, as far as possible, to the benefit of the crop.

3. *Agricultural.*—By this is implied the testing of strains or varieties evolved by the processes of selection and hybridisation, and also the trial of new methods of cultivation suggested by the physiological investigations.

4. *Commercial.*—Some system of seed control is essential, if purity is to be maintained in the stocks of seed produced.

To enable the production and development of special improved strains of cotton to proceed along satisfactory lines, the following organisation is recommended:—

Firstly, the *Botanical Section,* to be engaged on the establishment of pure races and the production of sufficient seed to allow of adequate experimental trial of these types, and for their subsequent multiplication.

For the next stage, an *Agricultural Section* requires developing, which can deal effectively with the trial of the new types produced by the Botanical Section. The whole country should be divided up into a series of circles, based, as far as possible, on "type traits" dependent on environmental conditions. The "circle" officers would each have an experimental farm under their charge, and should also have an intimate knowledge of their district, its capabilities, and requirements.

The stage following the experimental farm is the *seed farm,* which is concerned with the multiplication of the small stocks of pure seeds into a quantity sufficient for distribution to cultivators.

Mr. Leake hesitates to allot the control of these farms definitely to either the Botanical Section or the circle officers, but considers that it is a matter which can only be decided in the light of experience and with due regard to the factor of personal individuality. When the work of propagation on the seed farm is complete, the *Commercial Section* will take over the further control of the seed.

The circle officer in each circle will keep in touch with the cultivators to whom the seed from the seed farms has been issued, and will advise the *Commercial Section* as to their reliability as cultivators. He will inform the ginneries of the names of their cultivators and arrange for their cotton to be ginned separately. The Commercial Section will take over the seed from their crops, mark it with a Government mark indicating that it has been passed as seed to be used for sowing, and issue it, on payment, to growers throughout the district.

This process will take place year after year, fresh seed from the seed farms continually replacing that of the previous year. It is further suggested that the ginneries should be licensed for the sale of *taqawi* (seed to be sown), and that the ginners so licensed should assist in distributing seed to cultivators.

The above valuable report appeared in the First Annual Report, 1920, of the Cotton Research Board, Cairo, Egypt. I have considerably condensed it, retaining only those portions which, in view of the almost certain revival of the cotton industry in Queensland, may prove serviceable to our Government in its future dealing with the cotton industry.

SOME NOTES ON FUSARIUM IN THE TOMATO PLANT IN NORTH QUEENSLAND.

By N. A. R. POLLOCK, Northern Instructor in Agriculture.

Occurrence.—Some five or six years ago, this malady was first noticed in the Bowen district, where the tomato is cropped annually over considerable areas. In this district it is now of general occurrence, and few areas, even on virgin soil, are free from it.

At Townsville and in Cooktown it has also been noticed, but other areas where tomatoes are grown for market, such as Guthalungra, Gumlu, Cloncurry, Charters Towers, Cape River, &c., appear to be free.

Description.—The malady is caused by a fungus of Fusarium species, which invades the roots and spreads through the vascular tissue, up the stems and branches, and is evidenced, on cutting through a stem or root, by a brownish discoloration of the fibro-vascular tissue. The first indication of attack is usually noted by a bright yellowing of one or more of the bottom leaves, followed by a wilting of one or more branches. Where the plant has a tap-root, the whole plant will suddenly wilt and die off, but where no tap-root occurs, most frequently, one branch will be first affected, to be followed later on by others, until ultimately the whole plant dies off. The period from the first sign of attack to the death of the plant varies either from the resistance of the plant or from the severity of the attack, and plants may either die immediately or linger on for several weeks.

On examining a plant thus affected, the disease may be traced from the pale green or natural colour of a healthy stem showing the extent of its progress upward in the plant through a darker colouring down into the roof affected. Other roots may at first appear perfectly healthy, and those parts of the plants nourished from these roots may be also healthy, the disease being at first confined to one main root and a branch on the same side of the plant served by that root, but ultimately the whole plant will become affected.

Action of Fungus.—The progress of the fungus upwards, so denoted by the brownish discoloration, would indicate that the filaments of the fungus grow through the vascular tissue, breaking down the cell walls and filling them up, thus hindering the flow of sap and causing the sudden wilt of the part affected. A somewhat similar manifestation is seen in the instances of ringbarked trees where the sapwood is cut through.

It is possible that the disease may extend to the fruit, but no external signs, or, for that matter, internal signs, have been noticed with the ordinary pocket magnifying glass to indicate its presence.

Age at which Infection Occurs.—This varies a great deal. The disease sometimes shows a few weeks after setting the plants out, and from then on until after the first picking of the fruit.

I do not know of any instance where the disease occurred in the seed bed up to the time of transplanting, and it is not usual to find the disease in plants left in the seed bed, though neglected.

Volunteer Plants.—Self-sown plants appearing in fields where tomatoes were grown the previous season frequently show no signs of affection, whilst an occasion has been noticed in which every volunteer plant was badly affected. In this case, however, the land was sown to another crop, and there is every probability some damage was done to the tomato roots during cultivation.

Resistant Varieties.—While so far no particular variety of tomato has proved immune to attack, it has been observed that some varieties are more resistant than others. Early maturing sorts, notably "Chalk's Early Jewel," appear more subject than main crop varieties, in which "Burwood Prize" and "Buckeye" are favourites.

Period of Soil Infection.—No data are available as to the length of time the fungus may retain vitality in the soil, in the absence of a host to live upon, but evidence is abundant that the infection becomes greater when tomatoes succeed tomatoes.

DEDUCTIONS.

Seed.—It is apparent that disease is carried on the seeds. The practice of purchasing seed every year, in trying out new varieties from Southern parts and overseas, is common amongst Bowen farmers, and the appearance of the disease in isolated parts where tomato-growing is only occasional, tends to give credence to that view.

Soil.—Soils may have a bearing on the susceptibility of the plant. On the coast, where the disease has only so far manifested itself, acidity in the soil is common, while inland soils are usually neutral or slightly alkaline. At Bowen, where the disease has been under observation last season and this upon over seventy farms inspected, it has been noticed that there is no perceptible difference in the resistance of plants growing on the many different classes of soil, from the heavy black to the light sandy alluvials, which, to the best of my belief, are all more or less slightly acid.

It has been noted that seed probably carried spores of the fungus in the first instance, but when plants are set out and portion is healthy and portion affected, it is apparent that disease can be contracted through the soil.

Instances have been noted where plants from the same seedbed on virgin soil have contracted the disease when set out in old soils. Also, occasional instances of diseased plants have been noted where plants raised from seed from a disease-free district, in seedbeds on virgin soil, were set out in absolutely virgin soil.

It is evident that the fields on which diseased plants have grown carry infection, and that this infection can be carried to other soils by cultivating implements or other mechanical means.

How Infection Occurs.—As previously noted, infection probably occurs in seed. It may also develop in the root of the seedling, but I am inclined to believe that entry is more often obtained through damaged roots, in lifting from the seedbed, or from cultural implements afterwards. Observations on lightly affected plants incline to this view when, in tracing the disease down into the root, the darkest portion of the discoloration has been found to occur where the root has been damaged, while further on, to the end of the root, the fungus did not appear to have extended. Last season, when setting out, the roots and stems of plants, as far as the bottom leaves, were dipped in a solution of 1 part copper sulphate to 500 parts by weight of water, with a view to sterilising the broken rootlets, and at the same time they were watered with the same, or a weaker solution. Although complete immunity was not gained, it was noted that treated plants were longer in developing the disease than untreated.*

If the entry of the fungus is facilitated by damage to the roots, it is probable that these plants contracted the disease after the roots had grown beyond the soil in which the fungus spores should have been killed by the watering with the bluestone solution, and that then had received damage from cultural implements.

Were it only possible for the plant to contract the malady from injured roots, it might be possible, by treatment, to keep the plants free, and by a rotation of crops, to kill the fungus out by starvation.

Once contracted, it is apparently absurd to attempt curative measures on the plant, even if such could be successful, whilst a sterilisation of an affected soil by mechanical means would appear too expensive, especially when reinfection could so easily occur.

A rotation of crops naturally is suggested, and this, in my opinion, will be the prime factor in disease control. It may be found later that the influence of one or more particular crops may have a greater effect than others in lessening soil infection, especially if such are ploughed under. The sweetening of the soil by liming and increasing the amount of plant food by applying fertilisers to ensure a vigorous growth are necessary operations, more conspicuous in their neglect than otherwise amongst Queensland farmers.

In addition to the foregoing, and equally as important, will be the raising of disease-resisting strains and more careful attention to seed selection.

**Where plants were not dipped in this solution many were lost by cutworms, but in no instance was their attack manifested on plants that had been treated.*

The view is often expressed that no person can select seed better than the farmer himself, and the spread of Fusarium to Bowen and other parts of North Queensland, must be directly traceable to infected seed raised elsewhere. Given a proper system of fertilising, rotation of crops, and special varieties, the use of copper sulphate in sterilising wounded roots, and the systematic spraying of the foliage, the tomato should remain a most remunerative crop in Bowen and other centres of the North.

THE BLOWFLY PEST.

REPORT OF THE SPECIAL BLOWFLY COMMITTEE, INSTITUTE OF SCIENCE AND INDUSTRY.

HISTORICAL NOTE.

When the Director of the Institute of Science and Industry (Mr. G. H. Knibbs) was in Brisbane recently, he instructed the local Special Blowfly Committee to furnish the Press with a comprehensive review of the experimental work which has been carried out in Queensland. The subject is a very important one to the pastoral industry, and a very great deal of research and experiment has been devoted to it in the effort to find a method or a specific which will relieve the prime industry of the Commonwealth from its greatest menace. The committee, therefore, has decided to issue all the useful information at its command in the form of short articles, dealing with their investigations into the different phases of the problem. The investigations will be considered under the following headings:—

1. The beginning and effects of the pest.
2. Measures taken to combat blowflies—
   (*a*) Department of Agriculture and Stock;
   (*b*) Institute of Science and Industry.
3. Methods of destroying flies—
   (*a*) Traps and poison bags.
   (*b*) Parasites and natural enemies.
4. "Jetting."
5. Dipping.
6. Conclusions and recommendations in considering the data given above.

The present article combines Nos. 1 and 2 of the series.

EFFECTS OF THE PEST.

For very many, probably hundreds of, years sheep flies have been known to British sheep-farmers, yet it has not been, nor can it be, the serious problem in Britain which it is in Australia. Where they are comparatively small flocks, say, under a thousand head, it is an annoyance. Here, where the numbers range from thousands up to hundreds of thousands, the fly pest is a menace, the losses from which in the past ten years have run into millions of pounds sterling. In Britain, too, there is a respite every year owing to the presence of snow and ice for several months, while in Queensland especially, flies are in evidence whenever there is a fall of an inch or two of rain, whatever the season of the year. Last winter, for instance, flies were very active on Dalmally. Therefore we cannot use British experience under Australian conditions. We must work out our own salvation. Whether we have done so or not will be seen later.

As was pointed out by Mr. W. W. Froggatt, of New South Wales, in his "Bulletin No. 5, on Sheep Maggot Flies," rams' heads have been blown "since far distant days." In Queensland rams' head blankets, saddlecloths, wool bales, &c., have been attacked by flies for the past forty years at least, but it was not until about 1896 that lambs' tails were noticed to be attacked, thus necessitating dressing. Then came a series of dry years which culminated in the big droughts of 1900-1902, when Queensland lost over ten millions of sheep. All the losses were put down to drought, yet it is possible that flies may have taken their quota. In any case, from 1902 on to 1913 fly attack became more and more severe, until in the latter year reported losses were so great that the Government deputed Mr. A. H. Cory, M.R.C.V.S., and Mr. Edmund Jarvis (Assistant State Entomologist) as a Commission to inquire into the matter. With them was associated Mr. W. G. Brown (State Sheep and

Wool Expert). They visited the Longreach, Peak Downs, and Springsure districts. Forty pastoralists, representing over one million of sheep, were visited, and results showed that an average of 23 per centum of the sheep had been struck. Five stations had from 40 to 70 per cent. affected. In Messrs. Cory's and Jarvis's report, "Sheep Maggot Fly Pest, October, 1913," a recommendation was made that the State should establish a set of experiments to try and find a specific or a method of dealing with the problem. This recommendation was adopted, and in 1914 650 ewes were purchased and taken to Gindie State Farm, in the Emerald district, Central Queensland. Here, in the course of four years, trials of numerous dips, dressings, fly traps, and other methods of combating the fly were tried under field conditions. Among all the dips and dressings tried none was found effective except it was poisonous, and even then effective for a short period only. Traps were tried with a certain amount of success as far as catching flies in large numbers was concerned. The Orion Downs method of jetting a poisonous dip was also tried, with a success which gave hope for something better in the future. All these trials will be discussed in detail in their place. At the close of 1918 the Institute of Science and Industry appointed a Special Blowfly Committee in Queensland, and the experiments at Gindie State Farm were handed over to that body.

Commonwealth Institute.

At the latter end of 1917 the Commonwealth Institute of Science and Industry decided to put aside a sum of money to be devoted to the investigation of the problem of combating the blowfly pest in the Commonwealth. In February, 1918, a Queensland Committee was appointed by the then Director (the late Dr. Gellatly). It consisted of Messrs. S. P. Fraser (representing the pastoralists), A. H. Cory, M.R.C.V.S. (Chief Inspector of Stock), J. B. Henderson (Government Analyst), and W. G. Brown (State Sheep and Wool Expert), who at that time was in charge of the Gindie experiments. An announcement was made in the Brisbane Press that a suitable station was desired on which to operate. The Committee was very fortunate in receiving an offer through Mr. J. M. Hunter, then Minister for Lands, from Mr. W. A. Russell, of Dalmally Station, Roma. The station was inspected by the Committee, who found that it was eminently suitable. Mr. Russell was very enthusiastic, and it was owing a good deal to his public spirit and generosity that the way was made smooth for the experiments. At his own expense he installed a shower dip, a 60-ft. swim dip, a jetting plant second to none in the State, and furnished as many sheep as were required, with yards, &c., for the working of the experiments. On acquiring these facilities the Committee decided to work on the lines which, on the strength of results of the Gindie experiments, had been found the most promising. These were the use of poisonous dips, the use of jetting plants after the method of Orion Downs, the trying out of fly traps, &c., and the study on the entomological side of flies and parasites. For the latter purpose an entomologist was appointed to take charge of the scientific side of the problem. When the Dalmally experiments were in full operation the State experiments at Gindie were suspended. It has been said that experiments since 1914 have been very slow in achieving results, but it must be remembered that since the fly became very serious, fifteen years ago, the whole pastoral community has been working, mostly in the dark, towards control of the pest, and unsuccessfully. Necessarily there has been much groping in the dark since the beginning of experiments. Then, again, there have been several breaks of continuity during the dry years, when flies were quiescent. However, enough has been done, and many lessons have been learnt, both from the practical and scientific side, to warrant the committee in saying that there is a strong hope that the evil can be controlled, and at a reasonable cost. The above is a very bare outline of the work attempted in Queensland, and it remains now to give in detail the operations themselves with all available information.

Methods of Destruction.

The following notes deal with methods of destroying flies—

(*a*) By traps and poison bags.

(*b*) By parasites and natural enemies.

Traps.—Traps were first used about nine years ago, when they were advocated by Messrs. Cory and Jarvis. Claims were soon made by persons interested that the fly pest could be controlled and blowflies eventually exterminated by means of traps. Many styles were put on the market, together with different lures; and, when first tried, the enormous catches of flies led the pastoralists and others to believe that this means was likely to be successful. The result of this belief was the installation of thousands of fly traps throughout the country; but it was soon seen that, although the catches in most cases were large, the effect upon the number of flies was not noticeable, and that the paddocks where trapping was in vogue had practically as many sheep struck as those where no traps were set.

From careful observations, we were forced to come to the conclusion that trapping was, firstly, not practicable on a large scale owing to cost, and, secondly, that it had no appreciable effect on the number of flies in the paddock. The reasons for statement No. 1 are—

(*a*) Baited traps become very much less effective three or four days after being set;

(*b*) There are no lures which are effective over a length of time;

(*c*) To be of any value at all the traps must be very close together, as the fly seems to be very local and does not appear to travel very far from its seat of origin;

(*d*) The labour attached to baiting and attending traps is considerable and expensive, and not a position much sought after by the available labour, and unless the traps are attended to daily they soon become ineffective.

Spiders spin webs across the entrances, the baits become unattractive, while rain spoils most of the traps, necessitating emptying and rebaiting.

With regard to the second reason, when traps are working well and are well attended to, the flies appear to be just as numerous as ever within a short distance of the trap, and it seems impossible to have them close enough to catch most of the flies.

Poison Bags.—With regard to poison bags, these were found to be practically valueless. The baits soon become unattractive and hard, and only when freshly poisoned do they catch many flies. Poisoning of dead offal is, however, a good means of destroying a great number of flies. It has been found at Dalmally that a mob of sheep jetted with arsenic will kill more flies than all the traps or poison bags set about the yards. After jetting, flies are always to be seen dead in great numbers about the yards and shed.

Parasites.—Apparently the best controller of the fly is the chalcid wasp. There are several different species known, the most common being the *Nasonia brevicornis;* the other species are scarcer. The *Nasonia brevicornis* is practically always present, and can be obtained by taking pupæ from any carcass or offal and allowing them to hatch out in a glass jar with a stopper of cotton wadding in the mouth, or a piece of cloth tied over it. It can easily be ascertained, by counting, what percentage of the pupæ hatch out chalcids or flies. But while the chalcid wasp has been found nearly all over Queensland where sheep are stocked, the fly pest has been steadily increasing. At the beginning of any fly attack, only about 25 per cent. of the pupæ are found to be parasitised; that is, every fourth pupa is breeding out from ten to twenty wasps instead of one blowfly. On the other hand, towards the end of a fly attack, over 80 per cent. of the pupæ have been found to be parasitised; that is, at least four out of every five pupæ are breeding wasps—about a dozen wasps each; the fifth is producing one blowfly. These considerations led us to think, at an early stage of the investigations, that the cultivation and distribution of the wasps would prove a very important factor in checking the flies. Investigations later on, by Professor T. Harvey Johnston and Mr. O. W. Tiegs at the Queensland University (see "Queensland Agricultural Journal," March, 1922), showed that the chalcid wasp in question only attacks those pupæ which are exposed on the surface, as it cannot burrow underneath. Unfortunately, the majority of the maggots burrow before pupating, these pupæ being therefore beyond the reach of the wasp. This probably explains why the chalcid wasp has not played a more important part than the early investigations forecasted, as the statistics then obtained only applied to pupæ found on or near the surface, where the wasp could most likely get at them. Other parasites than the chalcid wasp (*Nasonia brevicornis*) are known, one of which attacks the maggot before it pupates. Much investigation, however, into the life history of these parasites requires to be done before a definite scheme of utilisation of them can be devised. It promises, in the long run, to be the cheapest and most effective control of the blowfly pest. At present not nearly sufficient is known to offer any immediate relief. Owing to lack of funds, investigations are not being made in this direction by the Committee, but valuable work is being done on flies and their parasites by members of the Biological School of the Queensland University.

Natural Enemies.—Birds are most useful in destroying pupæ and the flies themselves. In Queensland, in sheep-grazing country, bird-life is not over-plentiful, but there are several species that are of great use. They can be classed under two headings—

(*a*) Those that clean up all offal and carcasses; and

(*b*) Those that feed upon the pupæ and flies.

We have, of those that clean up the carcasses and offal, hawks, scavenger kites, and crows; and those which take the flies and pupæ include the magpie, peewee,

swallow, willie wagtail, and several others. The most useful and persistent of these appears to be the willie wagtail, which eats flies, maggots, and pupæ. They follow the sheep about when feeding and alight on their backs, catching the fly when attacking the sheep. However, the natural enemies, like the parasites, do not prevent recurrent bad attacks by blowflies.

To sum up, it does not appear as a result of our investigations, so far, that either traps or poison bags are ever likely to prove an effective or economical means of dealing with blowflies on our large grazing areas. With regard to parasites, although a most promising method of attacking the problem, no parasite is at present known which is likely to be an important factor in the control of the pest. It must be remembered, however, that this is by far the most economical method of attack, and it is earnestly hoped by the Committee that funds will soon be made available from some source for a systematic investigation along this line of attack. The protection and encouragement of bird-life, particularly of the insectivorous birds, while not by any means a solution of the problem, is at least a factor which should not be neglected.

The succeeding articles will deal with dipping and jetting, and the last of these articles will be practically a résumé of each.

FRUIT FLY INVESTIGATIONS.

[THIRD PROGRESS REPORT.]

BY HUBERT JARVIS, Entomologist in Charge of Fruit Fly Investigations at Stanthorpe.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has made available the Third Monthly Report of Mr. Hubert Jarvis, dated 16th May, 1922.

WINTERING OF FRUIT FLY.

The Queensland fruit fly *D. Tryoni* is still occasionally to be met with in the Stanthorpe district during the warm hours of the day (*i.e.*, between 11 a.m. and 4 p.m.) in the vicinity of packing sheds, or in any such situation where fruit is stored. It is, however, but rarely seen at this time of the year in the orchards, nor has it been observed sheltering in the packing sheds.

The majority of the fruit flies kept in captivity in the laboratory are still alive, although a number have succumbed, most probably owing to the low temperature obtaining at night and early morning during the last ten days. Frosts have, in fact, been experienced for several consecutive nights.

Fruit flies subjected to outside (natural) conditions at night had apparently perished when examined in the morning; but in nearly every case they have revived on being warmed by the sun. The female fruit fly seems less able to stand cold conditions than the male, casualties due presumably to this proving to be almost invariably those of females.

No indication of the fruit fly's hibernating as a mature insect has so far been noticed.

PUPATION OF FRUIT FLY.

Location.—Pupæ have recently been found in the ground, below cases of stored apples and quinces, and these pupæ have so far, failed to give rise to flies. It seems probable, then, that a small percentage may winter in this condition, in or under the packing sheds.

Fruit fly maggots do not necessarily always require access to the soil to enable them to turn to the pupa or chrysalis, for they will complete this change in any dry corner of a shed, packing case, or even when wrapped in paper. Usually, however, the instinct of the maggot seems to direct it to the soil, and it will squeeze, almost miraculously, through the smallest crack in its effort to reach the ground.

The soil under the wooden floor of the packing sheds (in many cases the soil is the floor) is generally both very hard and dry, and the maggots would, in gaining it, have to content themselves with about a quarter of an inch depth of dry dust in which to pupate.

Darkness.—The need of darkness is probably a governing factor in this persistent effort of the maggot to reach the soil—*i.e.*, to get under cover away from the light.

The majority of a number of full-grown maggots, taken when just emerged from the fruit and kept in a shallow box and exposed to full light, failed to complete the change to the chrysalis for from ten to twelve days. On the other hand, similar maggots confined at the same time in a dark box, without soil or any cover, all pupated within twenty-four hours.

Temperature.—This is also undoubtedly a very important factor in determining the duration of the pupal period. Thus pupæ under observation in the laboratory as winter proceeded, gave the following results in transformation:—

Host.	Date of Pupation.	Date of Emergence.	Number of Days.
Apple	16 February, 1922 ..	22 February, 1922 ..	6
Apple	28 February ,, ..	8 March ,, ..	8
Apple	7 March ,, ..	18 March ,, ..	11
Quince	20 March ,, ..	14 April ,, ..	25
Pear	6 April ,, ..	13 May ,, ..	37
Apple	20 April ,, ..	None to date	..

Note.—No fruit flies have emerged since 13th May, 1922. (Instruments were not available for the determination of the temperatures obtained during the periods mentioned.)

Persistence as Maggots.

Fruit-fly maggots are still present in stored fruit, although specimens under observation therein are very inactive, the temperature of the fruit, away from the sun, remaining very low all day.

Seasonal Absence.

Although probably not actively present in the Granite Belt area during the winter months, it is possible that the fruit fly may be met with then at a lower altitude than at present, and it is hoped to secure information relating to this possibility at an early date. The importance of safeguarding the fruit industry by "cleaning up," not only in our own district, but also in adjacent ones, where fruit trees are also grown, can hardly be too much stressed. Should the fruit fly be (as is quite likely) a seasonal visitor to this district from over the border, then adjacent orchards, if neglected, would be a very serious source of infection, and would, moreover, render partially ineffective the watchful care and cleanliness which we sincerely hope will be the aim of every orchardist in the coming season to preserve and exercise.

Cold Storage of Fruit.

A question—certainly one of very much interest—is that of subjecting fly-stung fruit, especially in the earlier stages, to the influence of low temperature (*i.e.*, cold storage) in order to kill the eggs and maggots of the Queensland fruit fly (*D. Tryoni*).

One experiment in this connection was originated by Mr. A. H. Paget, of The Summit. Mr. Paget sent ten cases of fly-stung apples (in which the maggots were mostly fairly well developed, but in which, also, both the eggs and young larvæ were represented), to Sydney, N.S.W., and had them subjected (in cold storage) to a temperature of from 33 to 34 deg. F. for a period of three weeks.

On their arrival, on being returned to Stanthorpe, a number of these apples were examined (about fifty) in this Office, and in every case, the maggots encountered therein were found to be dead, and had apparently been so for some time, as most of them were black and decomposed.

This certainly seems a step in the right direction, and were destruction by this means generally possible, such procedure should obviate the danger of fruit developing maggots from contained eggs after leaving the district, and when in the shops in Brisbane, or other centres, which so often happens with "stung fruit." A very much shorter time for submission to cold than three weeks would, however, probably be found effective.

(The results obtained by Messrs. E. A. Back and C. E. Pemberton, who recently carried out experiments in subjecting the eggs and larvæ of the Mediterranean fruit fly (*C. capitata*) to cold storage temperature in Honolulu, Hawaiian Islands, are as follow:—"No eggs or larvæ of the Mediterranean fruit fly survived refrigeration at 40 deg. to 45 deg. F. for seven weeks, at 33 deg. to 40 deg. F. for three weeks, or at 32 deg. to 33 deg. for two weeks." ("Journal of Agricultural Research," vol. v., No. 15.)

Experiments in this direction could be carried out in regard to our own fruit fly (*D. Tryoni*), and there is every reason to suppose that very similar results would be obtained.

Provided that it is an assured financial proposition to establish in the Granite Belt a central cold storage plant, it does not seem too great an assumption to conclude that such a cold storage must prove a very valuable asset to the district from the point of view that the results of these experiments constitute.

OTHER INJURIOUS INSECTS.

Grain Weevil.—An insect which is causing a certain amount of damage to stored apples is the "Grain Weevil" (*Calandra Oryzæ*), a member of the Fam. Curculionidæ. This little beetle mines and tunnels in the fruit, chiefly at the calyx end, causing a disfigurement of the apple, and probably also rendering the subject of attack more liable to the development of fungus troubles.

It has not so far, however, been known to damage fruit in the orchards, and is usually present only in apples exhibiting some mechanical injury.

Thrips.—An instance of these minute and interesting insects attacking garden shrubs (*Lauristina* sp.) was brought under my notice by Mr. J. Rudder, of Stanthorpe. The insect in question is probably an introduced one (*Heliothrips* sp.). It has, so far, not been met with on any economic plant or tree in this district. Should it be so discovered, it can be dealt with by spraying with a miscible oil, tobacco extract, or kerosene emulsion.

CASE MOTHS.

Psychidæ.—The case or bag worm moth (*Thyridopteryx hubneri*) has been found doing a great deal of damage to pines (*Pinus insignis*). Examples of these trees may be seen covered with their neat little caterpillar-cases made of pine needles, and having almost the appearance of small pine cones. This pest has also developed a taste for apple foliage. A lookout, therefore, should be kept for it in the orchards. It can, fortunately, be very easily both seen and dealt with.

Psyllidæ (Lerp Insects).—Specimens were submitted to this Office by the Editor of the "Border Post" for identification, and proved to be examples of one of a group of insects known as *Psyllidæ* (Genus *Thea*).

These curious sap-sucking insects, of which a short account (by the writer) appeared in the "Border Post" (5th May, 1922), happily confine themselves for the most part to our native flora. A European exception, however (*Psylla mali*) is injurious to the apple and causes a good deal of damage.

GRUBS IN PUMPKIN.

From the above source, again, were received a number of dark-brown segmented grubs found in decaying pumpkin. These were examples of the interesting maggot or larval form, of one of the stratiomyid flies (*Neoexaireta spinigera*). These flies usually breed in decaying vegetable matter, and are in no way responsible for any primary injury to fruit or vegetables. This fly is quite abundant in the district.

FUNGUS AND OTHER DISEASES.

Several troubles of obscure origin have been sent to this Office and have been referred to the Government Entomologist and Vegetable Pathologist, Mr. Henry Tryon, whose reports on the same have been duly received and have (by the courtesy of the Editor, Mr. J. Scully), been printed also in the "Border Post" of 12th May, 1922, for the benefit of orchardists and others.

PROJECTS ARISING FROM SEASONAL ABSENCE OF FRUIT FLY.

The carrying out, very shortly, of personal inquiries in the entire surrounding country of the Granite Belt area is contemplated. Thus it may be possible to locate the nearest point to this district at which the fruit fly occurs at this season of the year. Reports have reached this Office of an abundance of native fruits growing in the scrubs lying beyond the Queensland border, notably the Taboom Scrub, N.S.W., and it is our purpose to verify, or otherwise, these reports at an early opportunity.

OFFICE WORK.

Some time has been spent studying structural and other differences shown by the two fruit flies *Bactrocera Tryoni* and *B. Tryoni*, var. *solani*, and results arrived at should, when published, prove helpful to those who are interested in distinguishing these insects.

I am indebted to the following orchardists and others for specimens and material:—Dr. S. J. Roberts, Dr. Hurworth, Mr. J. Sewell, Applethorpe; Mr. A. H. Paget, The Summit; Mr. L. H. Flood, The Summit; Inspector F. Williams, Mr. F. Sellars, and Mr. J. Rudder, Stanthorpe.

Visits of inspection have been made to the following districts during the month:—Glen Aplin, Spring Creek, Diamond Vale, and Eukey.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS OF COWS FOR MAY, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Gay Lassie ...	Ayrshire ...	20 Feb., 1922	960	4·3	48·30	
Prim	Holstein ...	6 Feb. ,,	1,050	3·2	39·00	
College Cold Iron	Jersey ...	25 Jan. ,,	570	5·4	35·30	
Little Buttercup...	Holstein ...	12 Dec., 1921	780	3·5	31·80	
Magnet's Leda ...	Jersey ...	8 Feb., 1922	540	5·0	31·80	
Skylark	Ayrshire ...	7 Feb. ,,	630	4·1	30·20	
Auntie's Lass ...	,, ...	31 Oct., 1921	589	4·1	28·21	
College Prima Donna	Holstein ...	17 Nov. ,,	630	3·7	27·30	
Snowflake	Shorthorn...	20 Feb., 1922	630	3·7	27·30	
Lilia	Ayrshire ...	3 Mar. ,,	540	4·1	25 80	
Lute	,, ...	8 Jan., ,,	600	3·5	24·30	
College Evening Glow	Jersey ...	11 Oct., 1921	330	6·1	23·70	
College Ma Petite	,, ...	5 Feb., 1922	450	4·5	23·70	
Glow VI.	Guernsey ...	28 Aug., 1921	403	5·0	23·56	
Confidante... ...	Ayrshire ...	8 May, 1922	384	5·2	23·52	
College Nita ...	Holstein ...	26 Feb. ,,	540	3·7	23·40	
College Bluebell ...	Jersey ...	22 Oct., 1921	420	4·7	23·10	
Sheila of Nundorah	Guernsey ...	16 April, 1922	420	4·7	23·10	
Buttercup	Shorthorn...	28 Oct., 1921	540	3·4	21·30	
College Wildflower	Jersey ...	10 Dec., ,,	390	4·7	21·30	
College Promise ...	,, ...	6 Jan., 1922	390	4·5	20·70	

GRAPE CULTURE IN QUEENSLAND.

By ALBERT H. BENSON, M.R.A.C., Director of Fruit Culture.

PART II.

In the June number of the *Queensland Agricultural Journal* questions dealing with the suitability of different types of grapes for different parts of the State, soils suitable for grape culture, the preparation of land for the vineyard and the planting of the vineyard were considered, and we now come to

THE PROPAGATION OF THE GRAPE VINE.

The vine is one of the easiest plants to propagate, and yet it is by no means uncommon to meet with cases where there has been very little success and a bad stand of plants has been the result. The failure, in practically every instance, is due to lack of knowledge, and it can be obviated by carefully following the advice given below:—

Vines can be propagated by seeds, by cuttings containing several eyes or only a single eye, or by layering, and the plants so produced can either be used for the production of fruit or for stocks on which to graft or bud selected varieties. Growing vines from seed is not a matter for the commercial vigneron, but rather for the expert horticulturist who wishes to raise a new variety, and may, therefore, be put on one side.

Propagation by means of cuttings is the method commonly employed, and the cutting consists of a portion of the previous season's growth that is well matured and short-jointed so that there is no great space between the eyes. The cutting should be about 16 in. in length and no more; the use of cuttings of from 2ft. to 3 ft. in length, of which the bulk is left out of the ground, is one of the surest ways to bring about failure.

If the whole of the wood on the vine has matured properly it can all be used for cuttings if required, but it is always best to take the cutting from the older portion of the cane—that nearest to the old wood—as it is always the best matured and the surest to strike.

FIG 1.—Perfect Vine Cutting.

The canes to be selected for cuttings should always be of the last season's growth, free from anthracnose or downy mildew and grown on vigorous and heavily producing vines. (See Fig. 1.)

When the vines are pruned, the prunings should not be allowed to lie about for days in the vineyard if they are required for cuttings, as if they do so in dry weather for any length of time their vitality is seriously injured and a large percentage fail to strike.

Cuttings should be made as soon as the vines are pruned, or if this is not possible, with no more delay than is absolutely necessary. To prepare the cutting, a clean cut is made with a sharp knife or secateur, just below a joint, as if this is done the cut surface will soon callouse. The cutting is then heeled in or planted, after having been cut to the desired length by making a clean cut just above a joint, or, if wished, through the next joint above the top bud left on the cutting. By doing this there is less chance of the cutting dying out from the top cut.

If wished, a small portion of old wood may be left at the base of the cutting, but of course this can only be done with the base cutting on a cane when a portion of the previous year's wood has been pruned away with it.

Cuttings should be tied into bundles of convenient size, and either heeled in at once or be carefully packed if to be sent any great distance. Every care must be taken in heeling in and packing to see that the cuttings do not dry out, as once they become dry their vitality is seriously injured and many blanks will occur in the vineyard. If properly heeled in when fresh, they will keep in good condition till needed for planting and there should be very few, if any, misses.

Cuttings are either planted out in their permanent position in the vineyard, which I strongly advocate, or they are planted in nursery for a year and are then transplanted to their permanent position.

They are then known as rooted cuttings, and require much greater care in handling than unrooted cuttings, as they dry out rapidly if exposed to the direct rays of the sun or if carelessly handled or packed. Rooted cuttings, when removed from the nursery, should have all their roots other than those at the base of the cutting removed and the base roots shortened to a few inches in length. All the growth of wood that has been

made during the previous season should be pruned back to two eyes at the outside, and the cutting is then ready for planting, as previously described.

The removal of the surface roots causes the vine to root deeply, and there are no roots to interfere with the thorough and deep cultivation of the soil so essential to successful grape culture especially in the hotter and drier parts of the State. The hard pruning back of the wood growth encourages the production of strong new canes, one of which, no matter what type of pruning is subsequently followed, will form the main stem of the resultant vine.

Propagation by means of single eyes is seldom used here, and is therefore only mentioned as a method in vogue in other parts, and then mainly in connection with hot-house culture. Propagation by means of layers is also seldom resorted to, the only occasion in which it is found useful being where there are blanks in a bearing vineyard that it is desirable to make good. Cuttings or rooted cuttings seldom thrive if planted under these conditions, and it is found that the quickest way to fill the blanks is to take a long cane from an adjacent vine, bury it in a trench dug from it to the blank space the vine is required to fill, and bring the cane to the surface there. The cane is still attached to the parent vine, and when it is well established on its own roots it can be cut away from it.

RESISTANT STOCKS.

Several varieties of American and hybrid American-European grapes are more or less resistant to the attack of phylloxera, so much so that, although by no means immune to the attack of this insect, their root-systems are so hardy that they are not seriously injured. As a result, these resistant varieties are used as stocks on which to graft the varieties of commercial grapes it is desired to grow. Most varieties of resistant vines are of no value whatever for the production of fruit, but a few are direct producers, usually of very second-class quality fruit, and are therefore only used as stocks.

A cutting of a resistant vine can be whip- or splice-grafted with a scion of the variety of grape it is desired to propagate, and this work can be done easily and rapidly on a bench or table in a shed or other convenient place. The method adopted is described by Mr. C. Ross, as follows:—

"The whip-tongue graft is best practised on young vines or cuttings, and is performed as follows:—The stock and scion should be of the same diameter. A clean sloping cut is made slightly above the node of the stock, and a corresponding one below the node of the scion. The closer these cuts are made to the nodes the better, for it is near these points that the most of the knitting tissue is formed, and a more perfect union is the result. (See Fig. 2.) A short parallel slit is made about a quarter to half an inch deep, corresponding in each face of the splice. The slit is slightly opened by a turn of the knife to facilitate the insertion of the tongue. (See Fig. 3.) The larger area of cut surface thus brought into exact juxtaposition produces a greater amount of callous or knitting tissue. After being brought together, the splice is kept firmly bound with a ligature of rafia or soft twine." (See Fig. 4.)

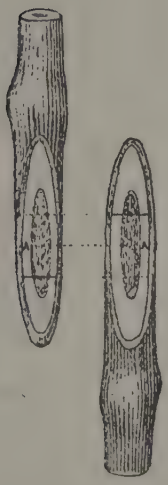


FIG. 2.—How Stock and Scion are cut for W.T. Graft. Centre dotted line shows where the slit forming the tongue is made.

FIG. 3.—Prepared Stock and Scion with tongue opened.

FIG. 4.—W.T. Graft brought together and ready for the ligature.

FIG. 5.—Proper Scion for Cleft Graft.

"After being grafted, the cuttings should be stratified in sand. When calloused they are planted out with the union well below the surface.

Many methods of grafting and budding are employed for working over established vines of indifferent varieties, but for all practical purposes the old English "cleft" and the "whip tongue" grafts are the only two that need be discussed. In my own experience I have found the cleft to be the most successful when grafting old vines level or under ground. The operation is very simple. For instance, select a vine of any age up to twenty years. Saw off the stem above the level of the ground in midwinter (June or July), and paint the transverse section with a mixture of horse dung and clay or lime and sulphur. In August, or just before the sap is moving, the stock should be again cut back to the level of the surface. Choose a backward or dormant scion, and shave it down to a wedge shape (see Fig. 5) from the base of a node down the internode; cleave the stock with a strong knife or chisel, and insert the scion down one side of the cleft. If the stock is large enough, two scions may be inserted, one on each side, bringing the inner bark or cambium layers of both stock and scion in exact juxtaposition." (See Figs. 5, 6, and 7.)

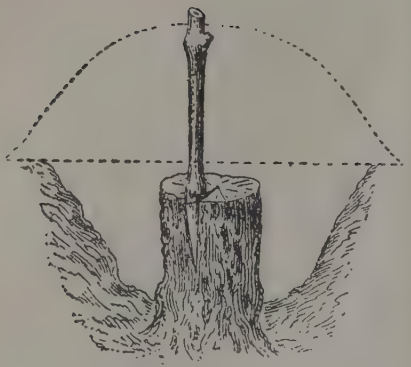


FIG. 6.—Single Cleft Graft.

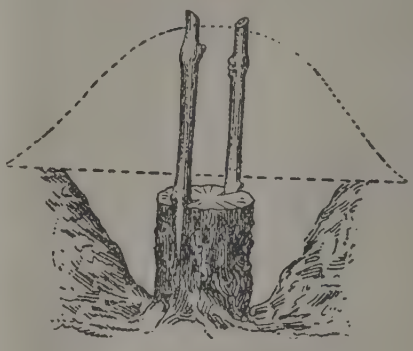


FIG. 7.—Double Cleft Graft.

CULTIVATION.

If the land has been thoroughly prepared in the first place, the subsequent cultivation, once the vines have been planted, is a simple matter, provided it is carried out systematically. Once the vines have been planted, the whole of the ground between the rows, if the vineyard is trellised, or the whole of the ground other than that actually occupied by the vine, if the vines are grown as a bush, must be kept well worked so as to prevent the surface of the soil setting and thus drying out, and also to keep down all weed growth. The first cultivation need not be very deep, but if dry weather sets in the subsequent cultivations must be gradually increased in depth until there is not less than 6 in. of finely worked surface soil. Such a soil mulch will tend to keep the moisture required for the proper development of the vines in the ground for several months, even though there may be no rain in the interval. Cultivation as described is essential in our hotter and drier districts, and provided that there are good winter rains it will insure a sufficient supply of moisture to mature a full crop of fruit. In districts having a better rainfall such deep cultivation is not so necessary; at the same time the land must be cultivated after every rain and the surface kept in a state of proper tilth. Once the crop has been gathered and the wood has thoroughly matured, the cultivations need not be so frequent. At the same time the surface of the soil must be kept from setting, and weed growth must be prevented. After the vines have received their winter pruning the ground should be ploughed deeply, as if the surface roots have been removed as directed there will be no danger of injuring the vines, as all the roots will be out of the way of the plough.

IRRIGATION.

The following remarks apply particularly to vines growing in our dry western country, where suitable water for irrigation is available. If the ground is very dry during the winter it should receive a good soaking after the vines have been pruned, and just before the sap commences to rise in spring. The irrigation should be given by means of furrows between the rows, and enough water should be applied to saturate the whole of the land, as if this is done and the land is cultivated as soon as it can be worked without packing, the moisture can be retained and will probably be sufficient to produce a crop without any further irrigation, or even rain. Winter irrigation when necessary must be thorough, as a partial watering would do little, if any, good. Should

there be a fair winter rainfall followed by a very hot and dry spring, the soil may dry out, or at any rate become so depleted of moisture that the grapes will not swell out properly, and there will be a poor yield in consequence. When there is any danger of this, a good irrigation should be given at the time the grapes are forming their seeds, and this should be followed by systematic cultivation. If this is done no more water will be required. Frequent irrigations are not wanted, and they do more harm than good. Give a good soaking when necessary, and depend on cultivation to keep the moisture in the soil.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING MAY, 1922, AND 1921, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of Years' Records.	May, 1922.	May, 1921.		May.	No. of Years' Records.	May, 1922.	May, 1921.
North Coast.					*South Coast*—continued:				
	In.		In.	In.		In.		In.	In.
Atherton	2·24	21	1·29	2·53	Nambour	5·10	26	5·33	3·78
Cairns	4·75	40	3·94	6·50	Nanango	1·67	40	0·16	1·31
Cardwell	3·83	50	1·34	6·51	Rockhampton ...	1·63	35	0·15	1·25
Cooktown	3·18	46	1·46	2·18	Woodford	3·05	35	1·47	2·34
Herberton	1·80	35	1·16	2·92					
Ingham	3·76	30	1·79	4·20					
Innisfail	13·08	41	9·65	16·87					
Mossman	3·51	14	4·25	5·41	*Darling Downs.*				
Townsville	1·43	51	0·23	2·05					
					Dalby	1·38	52	0·20	1·96
Central Coast.					Emu Vale... ...	1·26	26	0·12	0·98
					Jimbour	1·27	34	Nil	1·47
Ayr	1·28	35	0·53	1·45	Miles	1·61	37	Nil	1·31
Bowen	1·40	51	0·07	0·99	Stanthorpe ...	2·01	49	0·06	3·05
Charters Towers ...	0·86	40	0·10	1·30	Toowoomba ...	2·35	50	0·18	1·23
Mackay	4·00	51	2·03	1·41	Warwick	1·66	57	0·03	0·88
Proserpine	5·45	19	1·66	5·44					
St. Lawrence ...	1·93	51	0·92	1·61	*Maranoa.*				
South Coast.					Roma	1·50	48	0·02	0·59
Biggenden	1·96	23	0·27	2·73	*State Farms, &c.*				
Bundaberg	2·82	39	0·51	2·04					
Brisbane	2·88	71	2·04	0·76					
Childers	2·42	27	0·50	2·62	Bungeworgorai ...	0·75	8	0·05	0·53
Crohamhurst ...	5·14	30	3·50	3·91	Gatton College ...	1·91	23	0·02	1·17
Esk	2·16	35	0·31	0·92	Gindie	1·14	23	Nil	1·44
Gayndah	1·63	51	Nil	2·63	Hermitage ...	1·42	16	Nil	1·06
Gympie	3·07	52	1·69	1·59	Kairi	2·49	8	1·10	3·50
Glasshouse M'tains	3·72	14	4·63	1·87	Sugar Experiment				
Kilkivan	2·00	43	0·17	1·18	Station, Mackay	3·73	25	...	1·76
Maryborough ...	3·16	51	1·60	1·96	Warren	1·39	8	...	0·94

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for May this year, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE E. BOND,
State Meteorologist.

BUTTER AND CHEESE SHOW.

The year 1921 saw Queensland produce 42,149,352 lb. of butter for export, and 16,016,000 lb. for local consumption, representing a value of £4,845,935.

Cheese factories produced 11,000,000 lb. of that commodity during the same period for export, and 2,000,000 lb. for local consumption, representing a value of £653,956.

Condensed milk production reached the value of £750,000, so that, exclusive of by-products, the dairy industry was worth £6,249,891 to Queensland in 1921.

It is now approaching in importance the sugar industry, the premier agricultural industry in this State.—Hon. W. N. Gillies.

The Minister for Agriculture (Hon. W. N. Gillies), in the course of his inaugural address at the opening of the butter and cheese show conducted at the Exhibition grounds by the Queensland Butter and Cheese Factory Managers' Association on the 22nd June, expressed the belief that Queensland was destined to become the chief dairy produce State in Australia, and provided the foregoing review of the present value of the industry to this community.

Following is an epitome of other points of an important address:—

The value and benefits to the dairying industry, from an educational point of view, arising from the meetings of managers of butter and cheese factories for the purpose of conferring upon questions associated with the manufacture of dairy foodstuffs and the management of factories generally can hardly be over-estimated.

The Department of Agriculture and Stock is always in readiness to assist in co-operating in any educational work that the dairying companies may institute. Further, it is always prepared to give technical instruction on chemical, bacteriological, and similar questions, so far as the dairying industry is concerned.

In addition to the dairy inspectors and graders connected with the Department, there are half a score of officers who are always eager to impart their knowledge to all those interested in the industry.

Mr. R. Winks, senior State grader, who judged the butter exhibits, had described to him the display as the finest he had ever seen, both as regards quality and uniformity of manufacture, and the judge attributed this all-round excellence of quality to the fact that the bulk of the butter on show had been manufactured under the pasteurisation system.

Referring to the announcement of the Minister for Customs on the previous day respecting the much-debated question of grading for export, the Minister expressed a hope that the agreement between the State and Federal authorities would provide for an equitable and amicable adjustment of differences in connection with the points at issue.

The Agent-General (Hon. J. A. Fihelly) had forwarded a communication in which he quoted the view of Mr. M. S. Foley, of Messrs. Foley Bros., that too much unsalted butter was being shipped from Queensland. Mr. Foley contended that not more than 25 per cent. unsalted butter should be despatched to the London market from this State. The Agent-General had then expressed the view that butter would stabilise at about 180s. and remain about that figure until Russia and Germany recommenced trade relations. War glut stocks had been cleared at from 60s. to 80s. per cwt. Recent prices were:—11th May, 164s. to 166s. per cwt.; 20th May, 162s. to 166s.; 3rd June, 158s. to 162s.; 10th June, 170s. to 176s.; 17th June, 192s. to 196s.; 21st June, 208s. to 210s.

Queensland is destined to become the greatest dairy produce area in Australia. We have the climate, the rainfall, and the land, and by applying science and intelligence to the production, manufacture, and sale of the article, this destiny will be fulfilled, provided of course that the purchasing power of the consumers enables them to obtain dairy produce—and not cheap substitutes—and at a price that will make dairying profitable.

Following are the particulars of the judges' opinions of the butters and cheeses entered in the respective competition classes:—

RESULTS.

BUTTER.

EIGHT WEEKS' STORAGE.

	Flavour.	Texture.	Salt.	Colour.	Finish.	Packing.	Total.
Queensland Farmers' Co-op. Ltd. (Booval)	54½	20	5	5	5	5	94½
Queensland Farmers (Grantham)	54	20	5	5	5	5	94
Oakey Co-op. Ltd.	53½	20	5	5	5	5	93½
Wide Bay Co.	53	20	5	5	5	5	93
Warwick Butter and Dairy Co. (Allora)	53	20	5	5	5	5	93
Downs Co-op. Ltd. (Dalby)	53	20	5	5	5	5	93
Queensland Farmers (Boonah)	53	20	5	5	5	5	93
Maryborough Co. (Kingaroy)	53	20	5	5	5	5	93
Downs Co-op. Co. (Crow's Nest)	52½	20	5	5	5	5	92½
Stanley River Co-op. Co.	52½	20	5	5	5	5	92½
Nanango Co.	52	20	5	5	5	5	92
Downs Co-op. Co. (Toowoomba)	52	20	5	5	5	5	92
Warwick Co. (Millhill)	52	20	5	5	5	5	92
Caboolture Co. (Pomona)	52	20	5	4½	5	5	91½
Caboolture Co. (Eumundi)	52	19½	5	4½	5	5	91
South Burnett Co. (Murgon)	51½	20	5	4½	5	5	91
Gayndah Co.	51½	20	5	4½	5	5	91
Downs Co. (Clifton)	51	20	5	4½	5	5	90½
Queensland Farmers (Laidley)	50	20	5	5	5	5	90
Port Curtis Co.	51	20	5	5	4	5	90
Wide Bay Co. (Gympie)	49	20	5	5	5	5	89

30 DAYS' STORAGE.

South Burnett Co. (Murgon)	54½	20	5	5	5	5	94½
Queensland Farmers (Booval)	54	20	5	5	5	5	94
Queensland Farmers (Grantham)	53½	20	5	5	5	5	93½
Queensland Farmers (Boonah)	53½	20	5	5	5	5	93½
Warwick Co. (Allora)	53½	20	5	5	5	5	93½
Downs Co. (Toowoomba)	53½	20	5	5	5	5	93½
Wide Bay Co. (Gympie)	53½	20	5	5	5	5	93½
Maryborough Co. (Kingaroy)	53	20	5	5	5	5	93
Nanango Co.	53	20	5	5	5	5	93
Downs Co. (Crow's Nest)	53	20	5	5	5	5	93
Downs Co. (Dalby)	53	20	5	5	5	5	93
Stanley River Co.	53	20	5	5	5	5	93
Oakey Co.	53	20	5	5	5	5	93
Caboolture Co. (Eumundi)	52½	20	5	5	5	5	92½
Caboolture Co. (Pomona)	53	20	5	4½	5	5	92½
Wide Bay Co. (Cooroy)	52	20	5	5	5	5	92
Queensland Farmers (Laidley)	52	20	5	5	5	5	92
Warwick Co. (Millhill)	52	20	5	5	5	5	92
Downs Co. (Clifton)	51	20	5	5	5	5	91
Downs Co. (Miles)	51	20	5	5	5	5	91
Gayndah Co.	51	20	5	5	5	5	91
Port Curtis Co.	51	20	5	5	5	5	91

FRESH.

Queensland Farmers (Laidley)	55	20	5	5	5	5	95
Queensland Farmers (Grantham)	54½	20	5	5	5	5	94½
Queensland Farmers (Booval)	54	20	5	5	5	5	94
Caboolture Co. (Eumundi)	54½	20	5	4½	5	5	94
Queensland Farmers (Boonah)	54	20	5	5	5	5	94
South Burnett	54½	20	5	4½	5	5	94
Warwick Co. (Allora)	54	19	5	5	5	5	93
Wide Bay Co. (Gympie)	54	19	5	5	5	5	93
Downs Co. (Dalby)	54	19½	5	4½	5	5	93
Gayndah Co.	53	20	5	4½	5	5	92½
Stanley River Co.	53	20	5	4½	5	5	92½
Downs Co. (Crow's Nest)	53	20	5	4½	5	5	92½
Maryborough Co. (Kingaroy)	53½	19½	5	4½	5	5	92½
Downs Co. (Clifton)	52½	19½	5	5	5	5	92
Wide Bay (Cooroy)	52½	19½	5	5	5	5	92
Caboolture Co. (Pomona)	52½	19½	5	4½	5	5	91½

CHEESE.

TWO EXPORT.

	Flavour.	Texture.	Colour.	Finish.	Total.
Pittsworth Co. (P. Factory)	47	25	14½	9	95½
Pittsworth Co.	45	25	15	9½	94½
Pittsworth Co. (E. Factory)	44	24½	15	9½	93
Downs Co. (Gowrie Junction)	43	24½	14½	9½	91½
Woodleigh Cheese Factory	43	25	14	9	91
Downs Co. (Jondaryan)	42	25	14½	9½	91
Downs Co. (Koondai)	43	24½	14	9½	91
Maclagan Valley Co. (No. 1 Factory)	43	24	14	9	90
Biddeston Co.	42	24½	14½	9	90
Downs Co. (Hodgson Vale)	42	24½	14½	9	90
Warwick Co. (Bony Mountain)	42	24½	14½	8	89
Warwick Co. (Greymare)	42	24½	14	8½	89
Downs Co. (Gowrie Junction)	40	24½	14½	9	88

CHEESE—*continued.*

TWO MEDIUM CHEESES—UNDER ONE MONTH.

	Flavour.	Texture.	Colour.	Finish.	Total
Pittsworth Co.	46	25	15	9½	95½
Merrimac Cheese Factory	45½	25	15	9½	95
Pittsworth Co. (P. Factory)	45	25	14½	9	93½
Biddeston Co.	44	25	15	9	93
Pittsworth Co. (E. Factory)	44	25	15	9	93
Maclagan Valley (No. 2 Factory)	43½	25	14½	9½	92½
Downs Co. (Hodgson Vale)	43	25	15	9½	92½
Downs Co. (Westbrook)	42	25	14½	10	91½
Warwick Co. (Elbow Valley)	42	25	15	9	91
Warwick Co. (Lord John Swamp)	42½	25	14½	8½	90½
Downs Co. (Koondai)	41½	24½	14½	9½	90
Downs Co. (Gowrie Junction)	42	24½	14½	9	90
Warwick Co. (Greymare)	40	24½	14½	9	88
Woodleigh Factory	39	25	15	9	88
Downs Co. (Jondaryan)	41	23½	13½	9½	87½
Warwick Co. (Bony Mountain)	39	24½	14½	9	87

TWO MEDIUM CHEESES—OVER TWO MONTHS.

Downs Co. (Jondaryan)	43½	25	15	10	93½
Pittsworth Co.	44	24½	15	9	92½
Pittsworth Co. (E. Factory)	43½	24½	14½	9	91½
Biddleston Co.	42	25	15	9	91
Woodleigh Factory	43	24½	14½	9	91
Warwick Co. (Elbow Valley)	43½	24	14½	9	91
Downs Co. (Koondai)	42½	24½	14½	9	90½
Merrimac Co.	41½	24½	15	9½	90½
Downs Co. (Westbrook)	41	24½	14½	10	90
Pittsworth Co. (P. Factory)	42	24½	14½	9	90
Warwick Co. (Lord John Swamp)	41½	24½	14½	9½	90
Warwick Co. (Bony Mountain)	41½	24	14½	9	89
Downs Co. (Gowrie Junction)	39	25	15	9½	88½
Maclagan Valley (No. 1 Factory)	40	24	14	9½	87½
Warwick Co. (Greymare)	39	24	14	8½	85½

TWO LOAF CHEESES—UNDER ONE MONTH.

Merrimac Co.	45	25	15	9½	94½
Pittsworth Co.	45	25	14½	9	93½
Maclagan (No. 2 Factory)	43	25	15	10	93
Warwick Co. (Elbow Vale)	44	25	15	8½	92½
Downs Co. (Jondaryan)	43	25	15	9½	92½
Pittsworth Co. (P. Factory)	44½	25	14½	8½	92½
Downs Co. (Westbrook)	42	25	14½	10	91½
Woodleigh Factory	43	25	15	8½	91½
Downs Co. (Gowrie Junction)	42½	25	15	9	91½
Warwick Co. (Lord John Swamp)	42	25	15	9	91
Pittsworth Co. (E. Factory)	42	25	15	9	91
Biddeston Co.	42½	25	14	9½	91
George W. Stanley (Rodgers' Creek)	42	25	14½	8½	90
Downs Co. (Koondai)	41	25	14	10	90
Warwick Co. (Bony Mountain)	39	25	15	9	88
Downs Co. (Hodgson Vale)	37	24	15	10	86
Warwick Co. (Greymare)	38	24½	14½	8½	85½

TWO LOAF CHEESES—OVER TWO MONTHS.

Pittsworth Co. (P. Factory)	46	25	15	9	95
Pittsworth Co.	46	25	15	8½	94½
Downs Co. (Jondaryan)	42½	25	15	9½	92
Biddeston Co.	42	25	15	9½	91½
Warwick Co. (Elbow Vale)	43	24½	14½	9	91
George W. Stanley	42½	24½	15	8½	90½
Downs Co. (Koondai)	41½	25	14	9½	90
Warwick Co. (Greymare)	41	25	15	9	90
Warwick Co. (Bony Mountain)	41½	25	14½	9	90
Merrimac Factory	41½	24½	15	9½	90
Pittsworth (E. Factory)	41½	24½	14½	9	89½
Downs Co. (Westbrook)	40	24	15	10	89
Downs Co. (Hodgson's Vale)	40	25	14½	9½	89
Woodleigh Factory	40	24½	14½	9½	88½
Downs Co. (Gowrie Junction)	38½	25	14½	10	88
Maclagan (No. 1 Factory)	40	24	14	9	87
Warwick Co. (Lord John Swamp)	38	24½	14½	8½	85½

THE QUALITY OF EXPORT BUTTER.

Paper read at the Annual Conference of the Queensland Butter and Cheese Factory Managers' Association at Brisbane on the 22nd and 23rd June, 1922, by Mr. R. W. Winks (Senior Grader, Department of Agriculture and Stock).

Going back about thirty years, some of us can call to mind the condition of dairying as it was then carried on in Queensland. The system—if it could be called one—was on a par with that practised by the Turcomans and other more or less nomadic hordes inhabiting the steppes of Western Asia and South-eastern Europe from time immemorial—primitive in the extreme. Cows were milked but once daily. The calves, getting all the richest of the milk, were allowed to run with their mothers during the day time. The cream was collected by gravitation, churned in any old thing from an old-fashioned plunging churn to a milk pail, and the butter worked and washed by hand just as one would knead a batch of dough. Is it to be wondered at that butter thus made (even though in its early stages it was often extremely palatable), owing to want of sufficiently cold wash water and to contact with the hands of the operator, would not keep sweet for more than a few hours? The whole process tended towards working the butter-milk in instead of working it out. Nobody dreamed of an export trade in those days. Queues of us used to line up at the various stores, and we were glad to accept as low as fourpence per lb. for our small parcels of butter. Then a change came.

A few enterprising men, among whom the late Mr. John Reid was the most prominent, and to whom the dairying industry is deeply indebted, made a beginning of what was known as the Proprietary Factory System. Almost simultaneously the then Queensland Government inaugurated the travelling dairy to go from place to place, giving instruction and practical demonstration to all who cared to attend the operations either as students or spectators. The travelling dairy was established ostensibly to teach farmers how to manufacture a uniformly marketable article, but in reality the object was to train dairy folk in handling the raw product at the farm, and thereby pave the way for the co-operative factory system. How it succeeded, the large number of well-equipped factories—both butter and cheese—afford ample evidence.

The separator and steam-driven machinery revolutionised the industry. I shall not weary you much further by recapitulating what nearly everybody now knows, but as the improvement or otherwise of our butter is the main subject of this paper I should like to say this:—One often hears the remark that butter was just as good twenty years ago as it is to-day. Now there is a certain amount of truth in this, but the high-class butter at an earlier period of the industry represented only a small proportion of the total output as compared with the position at the present time, and it is this discrepancy we are trying to reduce as nearly as possible to vanishing point.

For years past we have been gradually increasing the percentage of our first-grade butter, and now that pasteurisation has been adopted by the majority of our manufacturers, the amount of first-grade butter should get a still further uplift. In other countries, pasteurisation has long since got beyond the experimental stage, and experiments conducted by the Department of Agriculture here have only confirmed what in other parts of the world were accepted as established facts. It is in the improvement of the keeping qualities of butter that pasteurisation excels the older method. It also gives a better body, and a texture more free from sponginess and mottle, thus making it carry better. A notable feature of last season's output was the comparatively small amount of "fishy" butter. As to whether or not pasteurisation is responsible for this, it might be premature to offer an opinion.

NINETY-POINT BUTTER.

This much, however, can be said:—That of two lots of butter from the same factory, upon being regraded after being held in cold store for some time, one, the non-pasteurised, was decidedly "fishy," while the other was free from taint. Who can say but that pasteurisation may be the means of minimising, if not completely eliminating, this most objectionable of all taints affecting butter?

A positive menace to the export butter trade to which I would draw attention is the unduly large quantity of so-called 90-point butter—*i.e.*, a butter given full points for body, texture, condition, &c., and only 40 points for flavour. Butter of this description is always deficient in aroma, and rarely "noses" well, and yet to the taste there may be nothing really objectionable. The grader always has misgivings when stamping it first-class, for he feels certain it will not keep. Such butter may be serviceable for immediate use, but it will deteriorate even while in cold store, and after being released thence rapidly goes to pieces. The elimination of a few cans

of doubtful cream might easily make a 90-point butter score 92 points. In the past, when the same price was paid for a first-class butter, irrespective of what it may have scored, there was some excuse for manufacturers to turn out a butter of this class. Their argument was, in effect, that it was more profitable to the factory to get 100 boxes going 90 points than 75 boxes scoring 92 points, when the price per lb. was the same in either case. The present arrangement, to pay according to points value, has improved the situation, yet there is still too great a proportion of this minimum first-grade butter.

With two equally good judges, one might award a butter of this class 90 points while the other might give it 89. If the butter was intended for export, the probabilities are that the latter would be right. For where is the sense in stamping at this end as first-class a butter that it is odds on will turn out other than first-grade when opened up in London.

SHORT WEIGHTS.

The Regulations in connection with short weights were framed chiefly for the prevention of the practice of packing dairy produce at a weight less than that stated in the trade description—a custom somewhat prevalent in the past. In all the cases coming under my notice, however, during the past three or four years, I do not believe that there was one of actual dishonesty. Carelessness there may have been. Frequently boxes of butter containing 58½lb. and 59 lb. have been met with, while one actually tipped the beam at 60 lb. net. It has often happened that after a manufacturer had been penalised for putting up short-weight butter, he got the "wind up" and rushed to the opposite extreme. In a recent case a defaulting factory, to be on the safe side, submitted for examination two consignments amounting to 462 boxes, ten of which, taken at random from the grading floor, scaled on an average 57½ lb. net. The amount of butter (over ten boxes) given away in this one instance would have gone a long way towards purchasing a thoroughly accurate weighing-machine. This is by no means an isolated case. The main points in avoiding incorrect weights are a good scales and a reliable man to do the weighing; put 56¼ lb. of butter into each box, ramming the corners well. Stamp every box "bare weight." Then there is a quarter of a pound of butter to come and go on, should there be any shrinkage owing to the escape of free moisture. Then, provided the net weight does not fall below that given in the trade description, the factory is safe.

FAULTY PACKING.

Notice of defects in packing is often omitted from the grading memos., owing to the fact that they are frequently filled in before the butter is stripped. Besides, it is impossible for the graders to superintend the weighing of every box. The principal defect is in the butter not being packed into the corners of the box, making the cube irregular in shape and increasing the risk of contamination.

CONCLUSION.

As already mentioned, taken as a whole, the percentage of first-grade butter last season has perceptibly increased—a fact in which pasteurisation, beyond doubt, was a big factor.

Given favourable seasons, there is no question about the increased output. The first obstacles have been cleared, and though some yet have to be negotiated, things are moving in the right direction. I recollect when the manager of the travelling dairy advocated milking twice daily, nine out of ten of the young men addressed (and they were not schemers either) retorted "Milk twice a day! No, not for Father Peter!" with an emphasis that bespoke sincerity. Many of these young fellows are among the staunchest of factory suppliers to-day. Who knows but that in the not distant future rugging of cows when exposed to extreme weather conditions, when half the food they eat goes to keep up the heat of their bodies at the expense of the milk yield, provision for winter feed, thereby regulating the winter and summer supply of our dairy produce so that the bulk of it does not arrive in oversea markets at one particular period of the year, and other innovations described by the unthinking as the ravings of theorists, may be the rule instead of the exception, as at present? Quite recently I received a letter from a man in London who is in touch with the butter trade there, in which he informed me that millions sterling was being invested in Holland alone in improving their butter, which means another formidable competitor in the London market. Quality, therefore, every time and all the time, should be the slogan of our dairymen.

The opening up for closer settlement of the Upper Burnett, where there is a large area of ideal dairying country, will add enormously to the total output of our factories, and, unquestionably, will help to place Queensland ahead of any other State in the Commonwealth in the production of butter and cheese—a position to which her natural advantages entitle her.

THE SUMMER FALLOW.

As the underlying principles governing the preparation and cleanliness of land for cropping in Canada are applicable to other countries, the subjoined reprint from the March issue of "Seasonable Hints," issued by the Dominion Experimental Farms Authorities, Ottawa, has been made for the readers of this Journal:—

Under average western conditions, the summer-fallow must be regarded as a necessary evil. Years of experience have proved that a good summer-fallow is the foundation for good crops. The advantages of the fallow are that it cleans the land of grasses and weeds, stores and conserves moisture, renders plant food readily available, and leaves the land in excellent condition for early spring seeding. The disadvantages are that it is expensive, requiring much labour and the loss of a year's crop; it is wasteful of fertility, as often too much plant food is rendered available; it rapidly reduces the humus and vegetable fibre in the soil with resultant soil drifting.

For seven years an experiment has been conducted at the Lacombe Experimental Station in which, annually, seventeen different methods of summer-fallow treatment have been applied in order to obtain data as to the best methods of ploughing and cultivating the fallow. Some of the methods tried have been previous fall cultivation, shallow fall ploughing, different times and depths of ploughing, once and twice ploughing, different methods of cultivation after ploughing, and growing a forage crop on the fallow. The effects on the condition of the soil and the crop yields for two seasons following have been recorded. The deductions from these 119 tests are summarised in the following paragraphs:—

The two main objects of the summer-fallow are to kill weeds and store moisture, and, fortunately, both objects are attained by the same methods. Cultivation of the land to be fallowed should start at cutting time the previous year. If the binder is followed by the disc, moisture will be stored and many weed seeds will germinate and be killed by frost. If possible, this disced land should be harrowed early in the following spring. This will prevent evaporation and start a second crop of weed seeds growing. When the land is very dirty it should again be cultivated or disced immediately after spring seeding, as this will kill the growing weeds and start a new growth. All of this means work, but much of the labour will be saved when the fallow is ploughed, as it will be found that the soil contains much more moisture than a fallow not cultivated, and that the land ploughs very much more easily. *One standard rule should be to get the fallow ploughed early, and by the end of June at the latest.* The average results of the seven-year tests show an increased yield of wheat of 5 bushels 31 lb. from land ploughed on 15th May over land ploughed on 15th July. May ploughing is seldom practicable, but the fallow should be ploughed as early as possible after seeding. If the land is badly infested with weeds, particularly couch grass, it may be necessary to plough the land twice, but twice ploughing invariably reduces the yield of wheat. If the land must be ploughed twice, the first ploughing should be early and shallow, about 4 in. deep, with the second ploughing done as early in the summer as possible, and about 2 in. deeper than the first ploughing. The largest yields have been produced from land ploughed once and 5 or 6 in. deep. In heavy clay soils, deep ploughing may at times be necessary to break up a hard plan left by the plough. In some districts the custom is to manure the land previous to summer fallowing, but this is seldom good practice. Fallowed land usually has a surplus of available fertility, and better returns from the manure will be secured if it is applied on the first-year stubble and immediately ploughed in. After the land has been ploughed it should at once be packed or cultivated to break it down and prevent evaporation. When a good seed bed has been secured the land should be given cultivation only as required to kill grass or weeds. Too frequent cultivation, particularly with the disc, will cause drifting. The disc is good for breaking down sods and lumps, and acts as a packer; but for killing weeds and preventing drifting the duckfoot cultivator is very much more satisfactory.

The rule in many parts of the West, particularly in the drier areas, has been to summer fallow every third year, but it is yearly becoming more evident that methods must be adopted to avoid such frequent fallowing. Soil drifting, caused mainly by too frequent fallowing and the resultant depletion of vegetable fibre in the soil, is now in many parts as great a problem as moisture supply. Many experiments with summer-fallow substitutes are now underway, but for the drier areas the adoption of longer rotations in which more grass crops are grown seems a much surer method. Cultivation after the binder will do much to help the moisture supply, but nothing has yet been discovered to equal the bare fallow as a method of killing weeds and storing moisture. The bare fallow is so expensive that nothing should be allowed to prevent the work being properly done. A good fallow ensures two good crops, but to plough a fallow after the weeds have pumped all the moisture out of the soil and dropped a heavy crop of seeds is to ensure crop failure for two or three years.

[NOTE.—The seasons in Canada are the reverse of our Queensland seasons, and allowances must be made for climatic differences.—Ed.]

STOCK BREEDING.

The May issue of the "Journal of the Victorian Department of Agriculture" contains a very interesting and instructive paper, which is well worthy of the attention of dairy farmers in Queensland, entitled "Hints to Beginners," by J. S. McFadzean, Senior Dairy Supervisor. The paper, which was read at the Annual Convention of the Chamber of Agriculture, held at Horsham, 6th April, 1922, reads as follows:—

VALUE OF PURE BREEDING.

To increase the productiveness of the farm should be the principal aim of every man on the land. Nearly every farmer is a raiser of stock of some variety; and stock and stock products constitute a very large proportion of agricultural production. Higher-priced land, higher rates of interest, higher cost of living, and higher-priced labour make it most essential that everything possible must be done to increase the acre production, in order to show a profit on the work of the farm. Well-bred stock cost no more to feed and care for than inferior animals, but they bring in much more money. Well-bred sheep cut more wool and make better mutton than those of mixed breeding. A herd of pure-bred cattle will bring in better returns than cross-breds, whether for beef or dairy produce. In fact, for every utility a more even quality and more remunerative class of stock is obtainable by pure breeding than by crossing. If none but pure-bred sires were used in every line of stock-breeding, the acre production of every farm would be greatly increased; therefore, all matings made should be on the line of preserving purity of blood rather than cross-breeding.

BREED SPOILING.

Every farmer has not the ambition to become a breeder of stud stock. Very few indeed have that natural aptitude for the work which is essential to success; but this is no reason why those who are not stud breeders should persistently spoil the work of those who are. Australia possesses some of the most able stock-breeders in the world, who have done much to improve the breeds they are working with; but they are unfortunately surrounded by thousands of other stock-raisers who, by crossing and mixing up of both strains and breeds, are keeping the general quality of farm animals down to a very low level.

AN UNWARRANTED PREJUDICE.

Carelessness, want of thought, and want of knowledge all contribute to this unfortunate condition in agriculture; but an unaccountable prejudice against close breeding is responsible for the great amount of cross-breeding that is done. That such prejudice is able to exist is due to the fact that many people will accept the questionable statements of others rather than the definite evidence by which they are surrounded. The plain fact is, that all good quality which is present in domestic stock has been fixed there by close breeding, and all deterioration has resulted from indiscriminate crossing. There has, however, of late years, been a gradual change in regard to this subject in the minds of stock raisers. The advantages of higher grade animals are becoming more widely recognised each year, and more pure sires are being used. The younger generation of farmers includes a larger percentage of breeders of pure stock than were to be found thirty years ago; but the prejudice against close breeding is still sufficiently strong and widespread to seriously interfere with progress; and, until that is changed, advancement in stock raising will not be general.

BLOOD RELATIONSHIP ESSENTIAL.

The hackneyed phrase, "Like produces like," is used by almost every one who endeavours to explain the laws of breeding; and is intended to convey the idea that the parent stock must have characteristics in common, if similar features are to be reproduced in the progeny. But most of those who use the term overlook the fact that a likeness such as is essential to this reproduction does not often exist between a male and female unless they are related in some way. A true likeness usually indicates blood relationship. In very rare instances would the direct offspring be found to reproduce features which the parents had in common, unless blood relationship existed between them.

CLOSE BREEDING IN NATURE.

Those who declaim against close breeding base their whole opposition to it on the grounds that it leads to constitutional weakness; yet all round us in nature close breeding is the rule, and has been the rule for all time. Every variety and sub-variety of animal, bird, reptile, or insect breeds close, otherwise they would not

exist in varieties as we find them. Cross-breeding is not followed in nature; and no line of study on any species of stock can be carried on without accepting the fact that it owes its existence solely to close mating.

AN HISTORICAL EXAMPLE.

The earliest records of stock-breeding furnish evidence that this was recognised when our present breeds of domestic cattle were being perfected. The history of the British Shorthorn shows that the perfection of that breed in the year 1810 was the bull 'Comet.' This bull resulted from the successive matings of, first the bull 'Bolingbroke' with the cow 'Phœnix,' which were both sired by 'Foljambe'; then their son 'Favourite' was mated back to his dam 'Phœnix,' and the heifer 'Young Phœnix' resulted; and 'Comet' was a calf from 'Young Phœnix' by her own sire 'Favourite.' This bull was sold for 1,000 guineas, and is one of the foundation stock of the present-day Shorthorn. That this was not haphazard mating is seen from the mention that the Collings Brothers, who bred 'Comet' and many other high class Shorthorns, learned their business from the older breeder, Robert Bakewell, whose name is honoured as one of the founders of both Shorthorn cattle and British long-wool sheep. But it should not require any modern evidence to convince one who gives this subject serious thought, that it would be impossible for any breed of animal to have been perfected without close breeding; and it follows that what will make a breed, cannot be considered as tending to destroy it. Further, we come at once back to the fact that all cross-breeding which has been carried out by thousands of stock raisers since the time of Collings Brothers, has produced nothing but inferior stock.

Scrutiny of the pedigree of the present-day thorough-bred horse also brings overwhelming evidence of the success of close breeding; for in speed and stamina these stock give no suggestion of deterioration. Pedigrees of pure-bred sheep and dairy cattle also show that perfection in the flocks and herds of to-day has been maintained by close breeding—the whole of the evidence on this subject being strong in support of preserving a close blood relationship, and against cross-breeding.

GRADING UP.

This brings us back to where mention was made of the widespread loss which has resulted from cross-breeding. Bulls of unknown breeding—the outcome of repeated indiscriminate crosses of various breeds—are being used by many people who raise stock; and the progeny are invariably a grade worse than the parents. Where pure-bred sires are used the progeny shows improvement. Where pure-bred sires of one strain only are used successively, the improvement is still more marked. Still further progress is made where there is rigid selection of the females for each year's matings; and when such selection is followed by the breeding of an improved sire back to his own progeny, the offspring more quickly shows the desired quality.

CONSTITUTIONAL FITNESS.

The one thing which has to be borne in mind is that close breeding is not a system in itself. In nature close breeding is always accompanied by natural selection of the parent stock on the basis of stamina. Such selection is made as the result of fighting amongst the males at the mating season; and through all weakly animals succumbing to the stress of seasons, or the attacks of other animals or reptiles which are natural enemies of their species. Nature allows for selection by strength of constitution; and selection must be fully as rigid in all stock-breeding work by man. A weakling or faulty animal must not be used, or the weakness or fault will be intensified in the progeny by close breeding, just as strength and soundness is similarly reproduced. Close breeding, to be fully satisfactory, must always be accompanied by judicious selection on soundness of constitution.

APTITUDE FOR THE WORK.

No study of systems of breeding will, however, make into successful stud breeders, those who have not the natural aptitude for the work. Unless the farmer is fortunate enough to be born with the faculty of discriminating closely in regard to excellence in high-class animals, he will be well advised not to attempt special stud breeding; but to content himself by working under the advice of some one whose ability as a breeder has been proved, and who will direct as to both culling and mating. Many people who are not capable of doing this work themselves, are most diffident in acknowledging it, and they lose money in consequence. Natural aptitude combined with early training and experience qualifies for this work of stock selection, just as experts are made in any other profession; and those less fortunate should not hesitate to purchase their advice exactly as they would on a subject of law or medicine. The successful stock-breeder is the one most competent to be the adviser of others; and the latter would profit most by the arrangement.

STANDARD TYPE THE BASIS.

In all matings the basis of selection should be on standard show type. Every breed which has any claim to popularity, has been developed for utility purposes, and, in the breeding of these, symmetry and beauty of outline as well as soundness of constitution have been attained. The result, as shown in the high-class animals of each breed, is thus the work of several generations of breeders, each following up and improving where possible, on the work of those preceding; and all stock raisers should aim at maintaining those lines of excellence. In the perfection of symmetry of outline there has been no loss of utility quality; but rather there has been definite gain almost everywhere. More even production (and on a higher grade) is now obtainable from pure-bred stock than at any former period, and no better reason is required for the maintenance of standard type.

EXCLUSIVE STRAIN.

One thing, however, must be borne in mind by all those who raise stock, and this is that many strains of breeds are almost as distinct from others as though they were separate breeds; and, therefore, the crossing of these may give very unsatisfactory results. Where a strain of any breed has been established over a number of years a blood relationship will exist amongst the stock which may not blend well with that of another strain which has kept equally distant throughout its several generations. For this reason it is advisable that the purchase of sires be made on one line of breeding; so that, by continuing the line established by the stud breeder, the farmer or grazier may participate in whatever good results the breeder obtains.

HOW BEST TO WORK.

In conclusion, pure blood lines make for perfection in stock. The repeated mating of pure sires to cross-bred or grade stock will most quickly improve the quality of these latter when the sires used in succession are related. The mating of a selected sire to selected females of his own progeny is more certain to be beneficial than otherwise. The mixing of breeds is a destructive policy; while the crossing of strains should only be attempted under the guidance of expert advice. Increased acre production from stock raising is certain to result from the consistent use of a line of pure-bred sires, and success will be most marked when following closely in the direction advocated.

CANE PEST COMBAT AND CONTROL.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from Mr. Edmund Jarvis, Entomologist, who is stationed at Meringa, near Cairns:—

"CONDITION OF CANE CROPS.

"About the middle of last month (15th to 26th April) a nice fall of rain (6.13 in.) relieved a situation which, to many cane-farmers, was becoming increasingly serious. In my report for November last it was mentioned that beetles had appeared here in alarming numbers during the 1920-21 season, but that, fortunately, prolonged wet conditions had enabled the cane to attain to a good length before grubs became large enough to do much damage. Although present in considerable force, showers and cloudy days during the critical period kept the tops green, and sticks that had fallen were able to root afresh and so keep alive until crushing time.

"As foretold in the abovementioned report, beetles were very much in evidence again this year (1921-2), and being unchecked by any collecting, have succeeded in spreading farther afield and injuring cane in various localities which up to the present have been comparatively free from the pest.

"On some of the blocks at Greenhills the cane was completely destroyed, in spite of a favourable wet season, at a time when grubs were still in their second instar (half grown); showing the severity of the present infestation. Had dry conditions continued during the past six weeks, many growers would have lost heavily; but it is to be hoped that the recent rainfall, and an additional precipitation of 1.23 in. (30th April to 4th May) may tide us over the worst period of grub activity.

"COLLECTING AT GREENHILLS IN THE PAST.

"Desiring to learn something of the methods of cultivation and grub control practised at Greenhills in the early days of cane-growing, we have got into touch with a previous owner, who tells me that while at Greenhills he planted about 1 ft. deep,

and, on the whole, obtained fair crops. It seems that he tried 'moth-balls' when planting, but without success; so that his field experiments with this form of naphthalene gave similar results to those obtained recently at our laboratory (see March Report, 1922). Beetles were systematically collected and destroyed by him, this being apparently the only artificial control method that yielded beneficial results. He is of opinion that when early thunderstorms are followed by one week of continuous rain, there will be plenty of grubs the following year, but that if one or two days of wet be succeeded by dry weather lasting from four to six weeks, there will be fewer grubs.

"This information regarding the influence of climatic conditions as a controlling factor during the period of oviposition may prove to be of decided economic value, as it is only by such observations, extending over many years, that we can hope to acquire definite knowledge respecting various phases of natural control, and so be in a position at the end of the flighting season to form an approximate estimate of the probable strength of the enemy.

"CANE H.146 AT RIVERSTONE.

"A sample of this variety, which is credited with being practically immune from attack by the weevil-borer (*Rhabdocnemis obscura* Boisd.), was obtained last year from South Johnstone Experiment Station, and a row about 3 chains long, planted on 24th September at Riverstone, near Gordonvale, on land where the borer had proved troublesome the previous season. The sets had lost a good many buds during transit, so unfortunately there were many misses.

"When examined on 25th instant (eight months later) the result of this experiment was seen to be very encouraging, the canes in stools of H.146 being much longer, stouter, and of more vigorous appearance than those in adjoining rows of D.1135.

"Apparently this new cane is going to suit the district, and although resembling the latter variety in general habit of growth, possesses the following additional advantages:—The c.c.s. is 15.54, or 1.04 higher than D.1135, and the canes are stouter and longer. This promising variety, which was introduced into Queensland from Hawaii by the Bureau of Sugar Experiment Stations a few years ago, is a medium stout, olive-green cane, with slight black wax, eyes large and flat, internodes to 5 in., zig-zag appearance, habit erect, foliage thin and sparse, resembles D.1135 in growth, good striker and ratooner, rapid grower, practically self-trasher. Age, 11 months; fibre, 11.5; density of juice (Brix. 21.2). (D.1135 = age, 11 months; Brix., 19.03; fibre, 11.00). Its grub-resisting qualities have not been determined, but in all probability it should be equally if not more resistant than D.1135.

"EXPERIMENT PLOTS AT MERINGA.

"The plots at 'Carrah,' which had been treated between the dates 12th November to 8th December were inspected early this month (May).

"The various insecticidal substances applied to the surface of the soil, with a view to inducing beetles to avoid ovipositing in the treated areas, were naphthalene, chloride of lime, coal-tar, tobacco dust, and carbolineum emulsion, the size of each plot being one-eigth of an acre. The method of application, and the enduring qualities of the odours arising from these deterrents, were mentioned in the report for December, 1921.

"At the present time (6th May) the cane both on treated and check plots looks about the same in height and general appearance; and grubs, although present, have not yet done sufficient damage to enable one to form an opinion as to the results of the experiments. In about a month's time, however, after grubs have ceased feeding, it may be possible to arrive at a definite conclusion.

"TRAP-TREES FOR CANE BEETLES.

"In 1896 the 'Australian Sugar Journal' made mention of a certain tree growing at Mackay that for two years in succession had been crowded with cane-beetles, which, after feeding on the foliage, fell to the ground in a sort of paralysed condition and then died. Being anxious to test the killing properties of this tree (a variety of Persimmon) inquiries were made last October, with the result that the owner (Mr. James Croker) very kindly forwarded a number of suckers, taken from the identical tree mentioned, to this Experiment Station; and later on (4th May) was interested enough in our work to follow up this with three fruits from the same tree, so that seeds have now been obtained and planted here. Two of the suckers are growing, but have not, so far, made much headway. Probably the seedlings, which will not receive any check, may make a more rapid growth. In any case, by the time the next lot of beetles emerge there should be enough leaves on the suckers to enable us to test the value of this plant as a possible trap-tree in our district.

"TACHINID-FLY PARASITES.

"Breeding operations are now under way at the Laboratory, and the first lot of flies, from which we intend getting up our stock for liberation by rearing successive broods, have been obtained from the Riverstone district, where twenty-five specimens were let go last December among bored cane belonging to Mr. G. Alley. This cane, by the way, which was considered to be too badly infested to be worth cutting, has now been cleaned up by the parasites, the result being a fine healthy-looking crop of badila which harbours very few cane-borers. Pupæ of the tachinids were obtained from cane sticks in the field twenty-four days after liberation, and flies belonging to the first brood emerged from these pupæ on 22nd January (exactly five weeks after the first introduction).

"Judging by the above results, December appears to be a good month in which to liberate tachinid parasites, as at this time of the year flies from the first brood, emerging early the following month, have time to enter upon the second brood before the wet season commences, and the Empusa fungus parasite of this fly makes its appearance.

"The flies resulting from this second brood about the middle of February, having by that time run into four figures, should then have a good chance of becoming permanently established.

"Growers who visit the Meringa Laboratory during the next few months would be able to see these parasites breeding in confinement, and also the life-cycle stages of our digger-wasps, from the egg, which is laid on the body of the paralysed cane-grub, to the maggot, cocoon, and finally the imago or perfect insect."

A MANGOSTEEN FROM NORTH QUEENSLAND.

By C. T. WHITE, Government Botanist.

When in North Queensland recently in search for seeds of two native trees (*Garcinia Mestoni* and *Citrus inodora*), I was informed that a tree of the former was growing in an old garden at Edge Hill, near Cairns. Fruiting specimens of this tree have since been sent me by Mr. W. J. Ross, Instructor in Fruit Culture at Cairns, and they prove to be not the native mangosteen, but an Indian species (*Garcinia Xanthochymus*) cultivated sometimes in North Queensland.

The tree has been confused in North Queensland with the ordinary true mangosteen (*Garcinia Mangostana*), supposed to be one of the most delicious of tropical fruits; but the only tree we actually know of that species is one at the old Kamerunga State Nursery. The present plant was figured and described from Port Douglas as the true mangosteen in the pages of the "Queensland Agricultural Journal" for December, 1910; and another specimen at the same time from the Burdekin Delta was described as *Garcinia cornea*. So it is seen that the tree has been confused a good deal in the past.

Garcinia Xanthochymus (synonym *Xanthochymus pictorius*) is a native of India. The large ripe yellow fruits form an inferior sort of mangosteen. Roxburgh, a well-known writer on Indian plants, states that the green but well-grown fruits yield a bright-yellow juice, which when dried makes a very good gamboge water-colour, either by itself as a yellow or with others to form a green.

The fruit is easily told from that of the true mangosteen and from that of Meston's mangosteen by its pointed (not flat) top.

Mr. E. W. Bick, of the Botanic Gardens, informs me that the tree was grown at the Acclimatisation Society's Garden at Bowen Park some years ago, but could only be grown indoors, for as far south as Brisbane the winters prove too severe for it.

The name *Xanthochymus* comes from the Greek *Xanthos* yellow and *chyma* juice—from the yellow juice exuded by the fruits. The genus Garcinia is named in honour of a French botanist (Laurent Garcin), who travelled a good deal in the East Indies.

PLATE 1.—MANGOSTEENS ON THE BURDEKIN DELTA, N.Q.

NAMBOUR RURAL SCHOOL—A FLOURISHING INSTITUTION.

Since its establishment, over 800 students from the North Coast districts have received sound technical instruction at the Nambour Rural School. These boys and girls to-day are taking their places on the farms and in the homes, and are proving in a practical manner the value of the instruction imparted at an institution that is an ornament to the educational system of the State and a monument to the faith and foresight of its founders.

The first impressions of a visitor to the Nambour Rural School are of his entrance into a hive of industry; of an assemblage of young Queenslanders of fine physique, keen intelligence, and excellent training; of a staff capable, enthusiastic, and right-down on the job of turning out boys and girls who, in the ordinary course, must naturally be numbered among the State's best citizens.

This school was established as an experiment, and has proved a huge success. In August, 1915, the then Minister for Education, Hon. H. F. Hardacre, announced the intention of his Department to establish a rural school, and Nambour, it was considered, offered special advantages on account of its central position on the North Coast. In addition to ordinary instructional purposes, the school was intended for advanced boys who desired to specialise in agricultural subjects, and for girls who wished for tuition on the domestic side of farm life. The details of the scheme were worked out by the then Under Secretary, Mr. J. D. Story, and early in 1916 a third wing to the existing State school and an economically constructed workshop were provided for the accommodation of the technical students.

In January, 1917, the school was opened, under the charge of Mr. T. G. Fisher, now head master of Townsville West. There followed immediately an influx of boys and girls from the several centres along the North Coast line, extending from Petrie, in the south, to Tandur, in the north. Free railway tickets were issued to all students under the age of 18 years to enable them to attend. Such has been the success of the school that over 800 students from the North Coast districts have received technical instruction since its inception. These boys and girls to-day are taking their places on the farms and in the home, and are proving, in a practical way, the value of scientific and technical training for the farmers of the future. Though technical instruction is the main feature of the curriculum in the senior school, academic phases of primary and secondary education have not been lost to view. This is proved by the excellent results annually obtained by the students in examinations for State scholarships and high schools. In the words of Mr. J. D. Story, at a farewell function to Mr. Fisher in 1919, "The school's academic record is as good as any in Queensland." Agricultural science, milk- and cream-testing, beekeeping, poultry-keeping, wood work, tin work, leather work, and blacksmithing are among the subjects taught in the ordinary daily course, while evening classes in dressmaking, wood work, and commercial subjects have become an important regular feature of the school's technical activities.

For field instruction, visits are regularly made to the demonstration plots at Woombye State school and to surrounding farms and orchards. An officer of the Agricultural Department lectures regularly on fruit culture, and this would appear to be the first step towards co-operation in agricultural education between the two departments, as outlined in the new agricultural policy.

The girls are taught cookery, fruit-preserving, pickling, jam-making, confectionery, dressmaking, millinery, and laundry work. The popularity of these classes may be judged by the fact that dressmaking alone attracts an average of one hundred students each term.

On the athletic side the school is rapidly gaining fame. Teams in football, swimming, cricket, tennis, and basket-ball enter into their games with an enviable enthusiasm, which is inspired and maintained by an able staff of teachers under Mr. R. W. M. Steele, who succeeded Mr. Fisher in 1919.

At a garden fete on 27th May, opened by the Minister for Education, Hon. John Huxham, and at which every district centre was represented, finely finished samples of the students' work were exhibited, and their tradesmanlike excellence called forth much commendatory comment.

Photo: Murray Studios.

PLATE 2.—JUNIOR CLASSES AT PLAY, NAMBOUR RURAL SCHOOL. FRONT VIEW.

Photo: Murray Studios.

PLATE 3.—DISPLAY OF CLUB SWINGING BY NAMBOUR RURAL SCHOOL GIRLS AT GARDEN FETE, 27th MAY, 1922.

Photo: Murray Studios.

PLATE 4.—NAMBOUR RURAL SCHOOL FOOTBALL TEAM.

SCIENCE NOTES.

By EDMUND JARVIS, Entomologist.

Under this heading it is proposed to record each month discoveries and observations made at our laboratory relating to insect pests of sugar-cane and their parasites which are likely to prove of general scientific interest.

EARLY STAGES OF *MACROSIAGON (EMENADIA) CUCULLATA, MACL.*

A hyperparasite of the above genus—viz., *M. pictipennis*, Lea.—has during the past seven years been considered an enemy of our useful digger-wasp parasites, *Campsomeris tasmaniensis*, Sauss., and *C. radula*, Fabr.; having been found from time to time in cocoons of these scoliids collected in the field.

Nothing, however, was known respecting the life-cycle of these remarkable beetles until quite recently (December, 1921), when Mr. W. Cottrell Dormer, Assistant Entomologist, had the good fortune to observe specimens of *cucullata* in the act of ovipositing on the under-surface of leaves of *Ficus opposita* and *Urena lobata*.

The eggs, which are white and of elliptical form, and measure 0.156 by 0.45 m.m., numbered a hundred or more, and were placed close together but without definite arrangement amongst the hairs of the leaf, distributed over an area of about 1 to 2 square inches.

During the period occupied by the egg-stage they were kept under quite dry conditions in glass tubes, and a fortnight later had commenced to darken, becoming black, and finally hatching after 17½ days.

The minute and active triungulin (representing the first larval stage) resembles in general appearance and structure that of a closely related European species (*Rhipiphorus paradoxus*), and, like that insect, probably makes its way into flowers visited by hymenoptera, in the hope of attaching itself to some suitable wasp and being carried into its nest.

A *Campsomeris* wasp was placed by us for a few seconds in a large test-tube containing about 25 triungulins, and then immediately put under chloroform. Examination revealed numbers of these curious larvæ tightly embracing various hairs on the tarsi, clypeus, neck, pronotum, &c., of the digger-wasp. Even in so brief a space of time, and while the wasp was in active motion, they had contrived to jump upon or lay hold of it, and securely attach themselves.

Upon the latter reviving and discovering the presence of its minute enemies, it endeavoured to brush them off, but only succeeded in killing one and removing two others.

Subsequently these triungulins were carried underground by the host, and after oviposition had taken place one of them remained on an egg attached to the paralysed grub for three days, making no attempt to pierce the chorion, but apparently awaiting the appearance of the maggot of the wasp.

Unfortunately, this egg, being injured by an acarus, did not hatch, so we lost the opportunity of observing the behaviour of this hyperparasite towards the very young scoliid maggot.

In all probability its first larval instar, like that of *Rhipiphorus*, is passed inside the maggot of the digger-wasp.

This triungulin, which is figured on the accompanying plate , is a black and almost microscopic insect, barely visible to the naked eye, measuring 0.53 by 0.213 m.m., greatest body length and width; and 0.695 m.m. from front of head to end of anal bristles. By aid of a sucker situated ventrally on the anal segment it is able, when necessary, to stand on its tail, thus leaving all legs free when about to lay hold of insects to be used as carriers.

It appears likely that almost any nectar-loving species of hymenoptera or diptera, irrespective of size or economy, might be made use of by the triungulin, and in this way serve to transport it from flower to flower until its carrier chanced to alight on blossoms habitually visited by scoliid or other burrowing wasps, some of which might prove to be suitable hosts.

I may mention that the leaves of *Urena lobata*, on which eggs of *M. cucullata* are deposited, are glandiferous, two or three cup-like honey-bearing glands being situated on the edge of the leaf, close to the petiole. Perhaps the beetle purposely selects such leaves in order that her offspring may find nourishment prior to commencing their travels, and at the same time be afforded a better chance of meeting with insect carriers in the shape of small flies, &c., which might be attracted to leaves bearing glands of this nature.

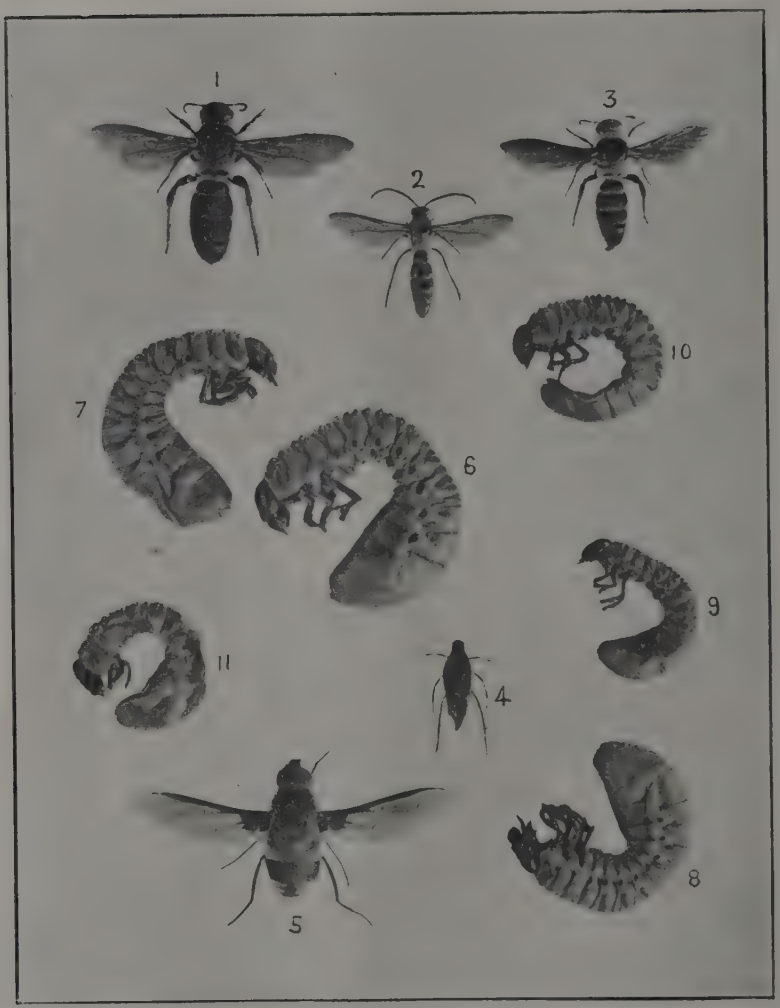


Photo. by E. Jarvis.]

PLATE 5.—CAMPSOMERIS TASMANIENSIS *Sauss.*, AND C. RADULA *Fabr.*, TOGETHER WITH THEIR HYPERPARASITES AND HOST-GRUBS.

(About two-thirds natural size.)

1.—*C. tasmaniensis* (female).
2.—*C. tasmaniensis* (male).
3.—*C. radula* Fabr. (female).
4.—*Macrosiagon pictipennis* Lea. (hyperparasitic).
5.—*Hyperalonia satyrus* Fabr. (*funesta* Walker).
6.—Grub of *Lepidoderma albohirtum* Waterh.
7.—Grub of *Lepidiota frenchi* Blackb.
8.—Grub of *Lepidiota caudata* Blackb.
9.—Grub of *Lepidiota rothei* Blackb.
10.—Grub of *Anoplognathus boisduvali* Boisd.
11.—Grub of *Dasygnathus australis-dejeani* Macl.

Note.—The grubs were photographed from spirit specimens, and are somewhat shrunken.

The continuous supply of food furnished by these various root-eating Scarabaeidæ, coupled with the fact of our average temperature during autumn and winter being about 73 degrees Fahr., enables species of Campsomeris to breed unceasingly and produce successive generations about every three months.

The lowest temperature recorded by the writer at Meringa during 1919, was 40 degrees Fahr. at 6.30 a.m.; and a few hours later, at 11 a.m., the morning being sunny, plenty of female digger-wasps were seen flying to blossoms of *Sida acuta* and *retusa*.

Grubs nearing the end of the second instar appear to be readily victimised by these scoliids. We have many records, for instance, of wasps of average size ovipositing on small second-stage *Lepidiota frenchi;* and conversely of females below the average size, parasitising big third-stage grubs of *L. albohirtum*.

Such readiness to oviposit on any host-grubs chancing to be available, whether large or small, while naturally enhancing the economic value of these scoliid wasps in Queensland, would add greatly to their usefulness in other countries into which they might be introduced as possible controlling agents against root-eating scarabaeid grubs.

The larval stage of the six hosts enumerated above occurs in the Cairns district during the following periods:—*L. albohirtum*, plentifully, from February to July; *D. australis-dejeani*, commonly, from January to May; *L. rothei*, locally plentiful from March to August; *L. frenchi* and *caudata*, and *A. boisduvali*, commonly, at all times.

The table given below, which should be of interest to parasitologists, indicates the extreme measurements met with in adult females of both species of Campsomeris, together with the average length and width of second and third stage grubs of each of the six hosts concerned:—

MAXIMUM AND MINIMUM LENGTH AND WIDTH OF SCOLIID WASPS.

		Minimum.	Maximum.
Parasites	*Campsomeris tasmaniensis* Sauss.	22 × 5·50 m.m.	30 × 7 m.m.
	Campsomeris radulo Fabr. ..	16 × 6·50 m.m.	27 × 6 m.m.
Average size of Hosts (natural curved form)		**2nd instar.**	**3rd instar.**
Hosts	*Lepidoderma albohirtum* Water.	22 × 7·50 m.m.	30 × 12 m.m.
	Lepidiota frenchi Blackb. ..	16 × 6·50 m.m.	25 × 10 m.m.
	Lepidiota rothei Blackb. ..	9 × 4 m.m.	14 × 6·75 m.m.
	Lepidiota candata Blackb. ..	21 × 7 m.m.	29 × 11 m.m.
	Anoplognathus boisduvali Boisd	16 × 5 m.m.	24 × 9 m.m.
	Dasygnathus australis-dejeani Macl.	12 × 6 m.m.	18 × 10 m.m.

FACTORS FAVOURABLE TO THE INCREASE OF "DIGGER-WASP" PARASITES.

AN ABUNDANT FOOD SUPPLY FOR THE LARVÆ.

Owing to some of our root-eating Scarabaeidæ having a two-year's life-cycle, cane-grubs may be found commonly at all times, although occurring in greatest profusion in the Cairns district from March to August.

One species of *Lepidoderma*, three of *Lepidiota*, and one of *Anoplognathus* are freely parasitised by *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr. The two favourite hosts, however, are *Lepidoderma albohirtum* Waterh. and *Lepidiota frenchi* Blackb.

Although previously reported (Bull. No. 7, Div. Ent., p. 15, 1918) that radula would not oviposit on grubs of *Dasygnathus australis-dejeani* Macl., subsequent experimentation by the writer with the autumn brood, during May of the following year, demonstrated that specimens of this wasp *bred* in our laboratory would very often parasitise larvæ of this Dynastid beetle. The negative results of former experiments in this connection may have been due to the fact that the wasps used in the first instance, had been ovipositing regularly for some days on grubs of *frenchi*, and so become accustomed to the fighting tactics of that species. In the absence of other hosts, virgin females of radula meeting with larvæ of *australis-dejeani* in canefields would probably victimise them as a matter of course.

I am inclined to believe that under natural conditions both *radula* and *tasmaniensis* —throughout their aerial existence—usually oviposit for the most part on grubs of the first suitable host encountered by them. We may reasonably assume that a wasp, after such initiatory contact, would profit by its experience, and be able thenceforward, even before entering the ground, to detect the presence of similar grubs on a plantation, and possibly distinguish them at once from those of related hosts that might chance to occur on the same area.

At Gordonvale, the Scarabaeidæ attacked represent not only different genera but three distinct sub-families, the larvæ of which, varying as they must necessarily do in habits, and to some extent in structure, would probably adopt slightly different fighting methods when defending themselves from digger-wasps. As an illustration (one of several cases) I may mention that a *bred* specimen of *tasmaniensis* that had from the first been regularly supplied with third-stage grubs of *L. albohirtum*—and during a period of 21 days had paralysed and oviposited on no less than 48 specimens of this host—upon being suddenly caged with a third-stage grub of *Anoplognathus boisduvali*, gave battle as usual, but was overpowered and cut in pieces by the new host; having, presumably, failed to immediately vary what had become its habitual method of attack in order to meet a changed, and unfamiliar, mode of defence. Strangely enough, the victorious grub in this instance was that of the smaller and less-aggressive of the two hosts concerned. As mentioned by the writer (Bull. No. 7, Div. Ent., p. 21, 1918), the laying of each wasp-egg is preceded by a duel, in which the parasite, although generally the winner, does not always escape unharmed. The seriousness of these subterranean combats is evidenced by the nature of the wounds frequently received. For example:—A specimen of *tasmaniensis* that lived 50 days in confinement, and eventually succumbed to such injuries after laying 65 eggs, was found to have lost ten joints of one antenna, four intermediate tarsal joints, and the same number from its hind feet; while a bred specimen of *radula* died from the effects of a gaping abdominal wound, after depositing 43 eggs.

AN ANNUAL PRODUCTION OF ABOUT FOUR BROODS.

In all probability the economic value of *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr. is mainly due to such factors as a favourable average annual temperature, coupled with an abundant food supply of grubs for the larvæ, which make possible the occurrence each year of at least four generations of wasps.

SPRING BROOD.

The first, or spring, brood is apparently derived from females which have started to lay towards the end of September, the earliest eggs from *radula* having been obtained on the 22nd and 27th of this month on hosts *Lepidiota frenchi* Blackb. and *Anoplognathus boisduvali* Boisd.; and from *tasmaniensis*, on the 27th and 28th, deposited on the latter host. Egg-laying, however, becomes general towards the end of October, and continues into November. Emergence of imagos from this brood takes place about the middle of December and extends into January. Thus a specimen of *radula*, captured 26th September, upon being supplied, a month later, with the third-stage *frenchi* grubs, laid 23 eggs between the dates 27th October and 25th November. A few of these were destroyed by acari; but, from the remainder eight male and nine female wasps were procured between the 16th December and 7th January. The life-cycle of wasps of this brood is about 47 days; the duration of the egg, larval, and intra-cocoon stages being 3, 8, and 36 days respectively; while the average shade temperature during the period of metamorphosis in the year 1917 was about 77° Fahr.

SUMMER BROOD.

No definite time can be assigned for the commencement of the second generation, as the preceding one merges insensibly into it, but, approximately, the period occupied by this brood dates from the middle of December to the middle of February. Female wasps of the first brood are able to oviposit within twenty-four hours after leaving the cocoons, and, being parthenogenetic, the females need not delay oviposition until after mating. Under natural conditions copulation probably takes place almost at once, as the males, which appear a few days before the females, usually remain near the spot from which they have emerged, flying restlessly to and fro over the surface of the ground, evidently anticipating the appearance of the latter sex.

Such behaviour is doubtless a response on the part of this insect to chemotropic influences induced by the occurrence in the soil of cocoons containing female wasps, and furnishes, indeed, a very striking illustration of tropic reaction. In the present instance this curious force, known as positive chemotropism, actually compelled numerous specimens of male digger-wasps, bred by the writer at Meringa in 1918, to haunt our laboratory verandahs for several days after liberation, instead of accepting their freedom and flying off to the fields in search of food or suitable

partners. During this period of expectancy they frequently entered and flew about the building, and when doors were closed they could often be seen knocking themselves against the glass, outside windows, endeavouring to get back into the room in which we kept breeding-trays containing female cocoons.

With reference to the duration of this second brood, the following summarised statement, derived from comprehensive data compiled by the writer during 1917-18, may be taken as fairly conclusive:—

The average lengths of egg and larval stages of *tasmaniensis* equal 3½ and 7½ days respectively, while the intra-cocoon condition (from 7th October to 11th February, at a mean shade temperature of 87° Fahr.) occupies a period of 36 days for male and 38½ days for female wasps, the minimum and maximum number for the male being 31 and 40, and for the opposite sex 32 and 43 days. The number of eggs obtained from a couple of caught specimens of this species, which were deposited in cages on grubs of *L. frenchi*, was 65, from which were bred fifteen males and sixteen females; but, quite likely, additional eggs may have been laid by these two wasps prior to capture.

Another wasp, which was caught 19th December, and lived 48 days in confinement, deposited no less than 65 eggs, from which resulted 13 males and the same number of females.

AUTUMN BROOD.

Two specimens of *C. tasmaniensis* bred at our Insectary on 11th and 14th March, deposited, collectively, 157 eggs upon grubs of *L. albohirtum*, these resulting in 113 cocoons, from which were obtained, between 11th May and 16th August, a total of 76 wasps, all being of the male sex. Bred males had been confined with these two females for some days in a breeding cage directly after emergence of the latter, but presumably conditions conducive to mating had not been established. Perhaps the cage used was too small (12 by 15 inches), or did not receive sufficient sunlight. Possibly newly bred males may not be in a condition to copulate until after having flown for a few days in the open. It should be mentioned, however, that a wasp bred here on 5th January, and confined for a time with a male in a small glass jar only 6 in. high, containing damp soil, apparently succeeded in copulating under such seemingly unfavourable conditions, as it deposited 49 eggs, from which were derived 3 males and 11 females. We may assume from the foregoing results that temperature and humidity probably play an important part in this connection. Absence of female wasps in the above-mentioned autumn broods was certainly not due to seasonal influences, for a check experiment conducted by the writer the following year (May, 1919) with female wasps captured in the field, and therefore, presumably, fertilised, proved this autumn brood to consist, like the earlier ones, of wasps of both sexes in about equal proportion.

WINTER BROOD.

Eggs producing this brood are laid in June or July. The cooler weather, as might have been expected, retarded development of the life-cycle stages, and the eggs, for instance, which during summer weather hatch about the third day after deposition, require from 7 to 10 days or even longer during winter, while the period occupied by the combined egg and maggot stages varies from 18 to 24 days, under an average shade temperature of 68 deg. Fah. These combined stages, however, throughout January (summer brood) occupy a period of only 12 days, the temperature at that time being about 82 deg. Fah.

Nine specimens of *tasmaniensis*, captured between the 8th and 13th July, laid collectively 92 eggs on third-stage grubs of *albohirtum*, which ultimately yielded 20 male and 8 female wasps.

These emerged between the 8th and 26th October.

It will be seen from the above that these four broods, if taken together, represent a period of about 270 days. This, if extended over the twelve months, would permit of an interval of about 30 days between each brood, thus allowing a wide margin for various natural breaks that hinder breeding activities of the wasps, such as drought conditions, excessive wet, cloudy days, &c.

FACTORS AFFECTING THE EGG STAGE OF OUR DIGGER-WASP PARASITES.

When dealing with subjects of such complexity, one cannot venture to do much more than outline a few of the chief controlling influences concerned; leaving almost untouched the intricate workings of natural control, which affect in varying degrees the multitudinous forms of organic life.

The eggs of *Campsomeris tasmaniensis*, Sauss., and *C. radula*, Fab., are placed singly on the mid-ventral area of the third or fourth abdominal segments of cane-grubs, and measure on an average about 3.20 m.m. by 0.90 m.m. They are greyish

pearly-white, of elongate cylindrical form with rounded ends, one of which (the less obtuse) is lightly glued by the wasp to the skin in such manner as to leave the egg projecting at right angles from the body.

Although placed within easy reach of its hind tarsi, the grub when normally paralysed does not disturb the egg, owing apparently to the sting having caused its legs to assume a bent contracted position, pointing towards the head. Hosts insufficiently paralysed, however, are able to move their legs with comparative freedom, and in such cases the egg of the parasite is almost certain to be detached sooner or later through accidental contact with one of the tarsi, a very slight touch being enough to knock it off.

During the course of experimentation it was found that these loose eggs, if artificially gummed to the ventral surface out of reach of the feet, hatched in due time, and the resultant larvæ matured in a natural manner. When two larvæ were forced to feed on the one grub, duration of the larval period was shortened, both spinning cocoons at the end of six days, and these ultimately producing a wasp of each sex. In an experiment made with five eggs artificially gummed to the body of a single grub, four of the parasitic maggots fed up successfully and spun cocoons, while the fifth, which had been put on the anal segment of its host, died, when half grown, from having imbibed juices contaminated with ingested earthy matter, which is always present in the last body-segment of our cane-grubs, and had evidently disagreed with it. One male and three female wasps were obtained as a result of this curious experiment, one of these being an abnormally small specimen of *C. radula*, measuring 14 m.m. in length.

Under natural conditions, the larva, when hatching, at the end of the third day, ruptures the free head-end of the egg, and, remaining in the pliable chorion, bends its head downwards until able to reach the skin of the grub; the still-attached base of the eggshell affords a support to steady the tiny parasite while biting through the tough skin, and buries its head securely in the living tissures of its host.

When emerging from a detached egg which has fallen on the soil, the young maggot appears quite helpless and unable to adapt itself to altered conditions, or to reach the body of the grub lying so close at hand. We may, I think, assume that under such circumstances fully 90 per cent. of eggs rubbed off by semi-paralysed grubs would inevitably perish, and that each lost in that way would, in five cases out of ten, represent a loss to the next brood of about thirty female wasps.

Destruction of Eggs by Acari.

Whilst breeding hundreds of digger-wasps at Meringa (1917-18), about 20 per cent. of eggs laid by these parasites were destroyed by Acari, which occur commonly on our various scarabæid grubs.

These Rhizoglyphid mites, according to Tryon, do not attack the grubs, but merely use them as carriers on which to travel through the soil until reaching congenial food. Whilst habitually roaming freely over the body they may, in the first instance, when meeting with a wasp's egg, be induced to feed on the sticky secretion attaching it to the skin of the host. The delicate chorion being soft and easily injured, such interference would soon result in rupture of the base of the egg, followed by an exudation of albuminous matter. This rich food proves very attractive, as, when eggs are so punctured, mites traversing the body soon discover and congregate around the tempting morsel. Acari occurring on a paralysed larva do not, so far as observed, feed on its body until life has departed and decomposition set in. In one instance, however, they were seen by the writer to devour a fully grown maggot of *Campsomeris tasmaniensis*, Sauss., that, having been forced to pupate out of a cell, had been unable to spin a complete cocoon. The mites in this case did not attack the living maggot until after some decaying remains of the host-grub on which they were feeding had been removed from the cage.

EGGS ATTACKED BY FUNGUS.

In a few instances a fungus (of undetermined species) was observed enveloping eggs and very young larvæ, which had received no mechanical injury of any kind, so apparently entomogenous in nature.

BACTERIAL DISEASE OF EGGS.

About 5 per cent. of eggs of *Campsomeris* laid at our Insectary were destroyed by some obscure disease (undetermined), probably of bacterial origin. This mortality was not due to infertility, since other eggs deposited subsequently by the same wasp produced larvæ, and ultimately imagos of both sexes.

The first indication of this disease appears near the head-end in the form of a few red lineolate marks, which after some hours become suffusions, until finally the entire central portion of the egg clouds over with pale rusty-red. In other cases the internal fluids gradually turn brown, the egg becoming more and more misshapen, until ultimately breaking down into a viscid mass.

The latter disease was recorded for the most part during October and November, the average shade temperature at the time being about 78 degrees Fah.

MORE LIGHT ON POWER ALCOHOL.

The possibilities of securing an abundant source of alcohol for power purposes affords a question which deeply concerns many regions of the world. The British Department of Scientific and Industrial Research is continuing investigations of this important problem. A special officer was appointed to collect data from different parts of the world as to the possibility of producing alcohol in bulk from local vegetable materials. The actual building up of alcohol from various substances, such as calcium carbide, has also been carefully studied. At present the results attained are not altogether promising; and the British authorities consider that the best prospect lies in evolving a process, either mechanical or bacteriological, of producing alcohol commercially from tropical vegetation or waste vegetable materials.

QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 12.

THE IVORYWOOD.

This tree is a tall scrub species, ranging from the Clarence River in New South Wales to Mount Perry, near Bundaberg, Queensland. It is known to botanists as *Siphonodon australe*. On account of the resemblance of the fruit, in size and shape, to the large yellow guava, it is sometimes known as the Native Guava. The trees attain a barrel diameter of 2 feet, and a height of about 130 feet; they are very tall, slender trees, as a rule. The barrel is not prominently flanged. The bark is mostly furrowed or wrinkled and is often scaly, is grey in colour, and when cut is seen to be light-brown, with a flesh-coloured innermost layer. It measures three-eighths of an inch thick on a tree with a barrel diameter of 2 feet. The trees are generally readily distinguished from other scrub trees by chipping off the outermost layer of bark and exposing a yellow or ochre-coloured substance in the interior of the bark. This deeply coloured substance can be found beneath the outer layer of bark in most of the trees. The wood is white or pale yellow, and very closely grained. It has been suggested as a substitute for English Box, a timber which it closely resembles in appearance.

Photo. by the Authors.]

PLATE 6.—THE IVORYWOOD (*Siphonodon australe*).
A tree, with a barrel 2 feet in diameter, in the Imbil Scrub.

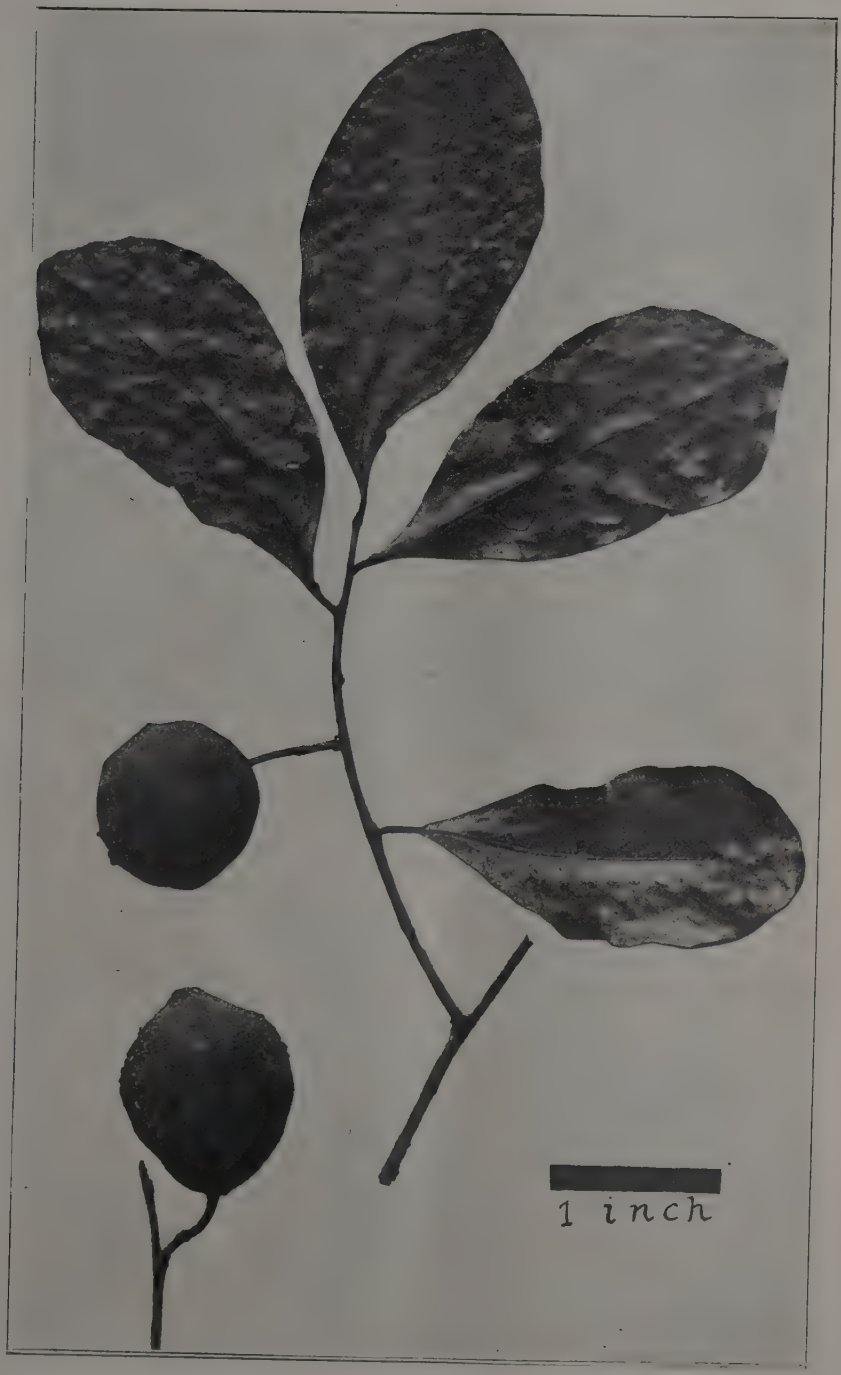


PLATE 7.—THE IVORYWOOD (*Siphonodon australe*).
Showing leaves and fruit.

THE BANANA BEETLE BORER.

The Hon. W. N. Gillies, Minister for Agriculture, has made available the following memorandum on the "Banana Beetle Borer" by Mr. John L. Froggatt, B.Sc., Entomologist of this Department:—

"In the banana-growing industry of Queensland, there appears to be a large number of growers who either do not understand how to detect or are unaware of one of the worst pests they have to face, and in some cases, combat—namely, the banana beetle-borer. Through this lack of knowledge many have found, to their cost, that they have either purchased an infested plantation, or, by introducing suckers from infested areas, have brought in the beetle-borer. Often before its presence is discovered it has become well established and has caused appreciable damage to the plantation.

"There are many banana-growers, and others interested, however, who consider that the beetle-borer is not a serious menace, and on this account do not worry and let the beetle continue its work of destruction unhindered. By so doing, they are laying up an abundant store of trouble not only for themselves but also for their neighbours and the district generally. Such plantations form ideal breeding-centres from which the pest may easily become disseminated.

"It is fully recognised, on the other hand, that there *are* growers doing all they can to combat the pest and many others who doubtless will also co-operate in checking the increase of the beetle-borer as soon as they realise the seriousness of the problem.

"After carrying out extended observations in the field, it is most apparent that the banana beetle-borer *is* increasing and spreading; this is particularly marked in plantations where control measures are either neglected or carried out in so insufficient a manner as to be of little or no value.

"In laying out a plantation there are two very necessary precautions to be observed—

1. Make sure that the plantation from which the suckers are being obtained is free from beetle-borer infestation.
2. Do not plant alongside or adjacent to infested areas. Where this has been already done, precautions must be taken to prevent the beetle-borer spreading into the new plantation.

"The founding of a clean plantation rests very largely on the strict observance of these precautions.

"To consider the reasons for these statements—

1. If a plantation be infested, even allowing that the suckers when dug out of a stool may be free from beetle-borer, yet while they are lying on the ground (acting for the time as baits) beetles may be attracted to and lay eggs in some, if not all, of them. The eggs, being very difficult to detect, may be entirely missed, even should an examination of the suckers be made. Where the suckers are large and vigorous and the season favourable, the suckers may develop into plants, even with one or two larvæ (grubs) in them. Once the beetle has become established in a plantation, it will require a great amount of constant systematic work to keep it in check.

   Butts, sometimes used for planting, are more easily examined than suckers, as, if infested, they should show larval tunnels on being opened up. Even in cases where they appear clean, however, eggs may be present and be overlooked.
2. A number of instances have been noted where plantations have been laid out alongside infested areas and have subsequently become infested. Where this is found to have been done, corm baits should be laid between the old and new plantations in alternate rows and examined periodically. Whenever practicable, it is advisable to dig out and destroy the infested stools, and baits should be laid out on the sites of the stools. This will help to hinder the beetles migrating, and the destruction of those trapped will further minimise the risk of infestation.

"The presence of beetle-borer at any stage beyond that of the egg stage, in a plantation, is most readily detected in the old butts, &c., in the stools or in stems or old corms lying on the ground. By cutting these open, the beetle-borer is evidenced, if present, by the larval tunnels; larvæ and beetles may be found. Suckers often, though not always, give an indication of beetle-borer by presenting an unhealthy appearance, noticeable particularly in the leaves. On being removed and cut up, if infested, larval tunnels will be seen in the corm.

"Where a plantation is found to be infested, all badly infested stools, and in slightly infested stools all old butts, &c., should be dug out and chopped into small

pieces; stems on the ground should be split lengthways. Burning, where practicable, is the most effective, of course. By this means natural decay and drying-up proceed very rapidly, and the grubs present are unable to reach maturity, while the butts and stems cease to be possible breeding-grounds. Corms dug out of the stools and left lying on the ground have been found to be breeding numbers of this pest *four years afterwards*. Stems cut down after bunching and left on the ground have been found to be breeding considerable numbers of beetles many months after being cut down. The rotten material of decaying stems also acts as harbourage for beetles. As soon as the stools are cleaned of the old material, large pieces of clean corm should be laid, cut surface downwards, flat on the ground, to act as baits, and the beetles found on the under surface of the bait, or just underneath the soil under the bait, removed and destroyed. These baits should be removed after about ten to fourteen days and destroyed, because eggs will be laid in them. As a result of tests carried out in the field, it has been found that the beetles are, apparently, in the greatest numbers in the immediate vicinity of the stools, so that the best positions in which to lay baits are inside and just outside the stools. If this work of prevention be thoroughly and systematically carried out, a great deal can be done to check the increase and spread of the pest, *but it must be carried out continuously to be effective.*

"To briefly describe the different stages in the life of the beetle—

"*The Egg* is white, and about one-twelfth of an inch in length. It is very difficult to detect in either plants or suckers; generally it is laid at the junction of the stem and the bulb, lying just under the surface of the plant.

"*The Larva* (or grub) when full grown is slightly more than half-an-inch in length, and rather stout. The body is white, with the head dark reddish-brown. It is the grub that causes the damage to the plant.

"*The Pupa* is white and about half-an-inch in length. It is nearly always found just under the surface of the bulb (below ground level in cases where the corm is in the ground). Just before full development is reached and the beetle is ready to emerge, the pupa shows a slight colouration (yellowish to reddish-brown). This is a resting stage.

"*The Beetle* (belonging to a group of insects commonly called weevils) is just under half-an-inch in length; it is black in colour and has a long, slightly curved trunk in front of the head. When disturbed it lies for a considerable time as if dead. Where it is present in a plantation it will be found in old corms and rotting stems or in the rotting butts in the stools.

"Many queries (and also many wild statements) are made on the subject of natural enemies (or parasites) of the banana beetle-borer. So far only one natural enemy of the beetle-borer is known in Queensland. This is the larva of another beetle which follows up the tunnels made by the grubs of the borer, and which has been observed to attack both the grub and the adult beetle. This parasite has only been found on three occasions, on two of which only a single larva was seen.

"Any positive information on this subject will be welcomed, as it is an important one."

In a previous report on the results of his work in the Southern Coast districts of Queensland, Mr. Froggatt cites two cases which were examined thoroughly in the early part of 1921—No. 1 in April, and No. 2 in January.

The conditions in the two plantations were similar, except as to age; both were well sheltered and below the ridge. No. 1 was about eighteen months old; No. 2, about four years. The depredations of the pest were approximately the same in both cases, being but slight, and localised in a small area.

In No. 1 plantation, on the discovery of the beetle-borer the owner immediately began to systematically destroy all infested corms and stems, and to lay "baits" in and around infested stools. These measures were carried out for several months. In July, 1921, this plantation was again carefully examined, when very little trace of beetle-borer infestation was found. Towards the end of 1921 this plantation was sold, and the new owner did not carry on these preventive measures. In May, 1922, beetle-borer infestation was found in approximately the same area and in apparently about the same numbers as when first found. Only a small number of old corms and cut stems were found to be infested, and the plantation looked very healthy.

In No. 2 plantation the pest had been allowed to progress almost unchecked, with the result that when a further examination was made in March, 1922, practically every old corm and cut stem was found to be riddled by the beetle-borer, as also were corms and stems in the stools, and this over a greatly increased area. In this time the plantation had gone back tremendously. This comparison, which was only one of many, showed, on the one hand, what could be done by consistently and systematically carrying out preventive measures, and, on the other, what happened through neglect of necessary precautions.

POULTRY.

SELECTION OF LAYERS.

The "Journal of the Department of Agriculture," Union of South Africa (April, 1922), publishes the following very useful and instructive paper by Professor A. Owen-John, F.B.S.A., Lecturer in Poultry, Grootfontein School of Agriculture, Middleburg, Cape:—

"Much has been written during the past few years on the very important subject of selection of layers. We, in South Africa, have not been backward in applying the various methods put forward from time to time as indicative of productivity in our laying breeds of poultry. It is by no means a difficult matter to select the layers at the end of the laying season, or after a fair period of productivity, as then the lack of pigmentation or bleaching in the various sections is sufficiently pronounced. The greater difficulty is to select the prospective heavy producer either at the commencement of her laying period or even before she has commenced to lay. It is in this connection that it is desired to make a few observations on the selection of layers.

"During the past three to four years I have carried out investigations at this Institution with a view to finding certain characters which could be considered indicative of high producing capacity in young birds. The method of procedure adopted has been as follows:—

"We have seventy-two individual test pens where the most promising pullets are tested out for twelve months; this test usually commences either in March or April. The breeds used in the test have been:—South African Utility White Leghorns, Brown Leghorns, White Wyandottes, White Orpingtons, and Buff Orpingtons.

"The ages of the various birds are from five months in the light breeds to seven months in the dual-purpose breeds.

"When the seventy-two birds are selected and allocated to their individual pens, a complete description is taken of each bird, and entered up on the back of the record sheet; no detail is omitted. The test is carried out for the year. Each egg laid is entered up according to date and grade—viz., first, second, or below grade, as the case may be. During the last week of the test another detailed description is taken and entered up on the back of the record sheet immediately below the first description, and comparison made between both, also with the record put up by the individual.

"In this way useful information has been gathered. Further, each year I handle large numbers of birds in the course of itinerary duties, when grading and mating stock, inspecting private plants, and judging at shows. Many of the birds so handled have been tested or are about to be tested in private as well as public laying tests, giving thus a still wider field for obtaining information.

"From the foregoing investigations we find that there are almost invariably found in pullets certain characters that will prove the birds to be good producers, and, therefore, of great assistance to the breeder when selecting his birds.

"In the first place, the head or skull should be of medium length, inclined to long (not short, as usually described). We have found this to be pronounced in all cases, particularly in Leghorns. Moderate length from back to front or base of beak, not snaky, with good depth from crown to underside, and of good width across the top. Beak of moderate length and stout. Eye bright and full, standing well out on each side of the head. The shape of the eye is important; the round eye is not so desirable as the oval shape.

"The neck should be of medium length, inclined to long, well covered with feathers and carving gracefully on to the body. The short neck is an indication of a sluggish disposition or an inactive bird; consequently a poor layer. Length and depth of body are essential, with good width of back, allowing full play for the ovaries, the depth of body, especially toward the posterior of the bird, denoting capacity. This should not be confused with a short breastbone, which would naturally allow sagging of the abdomen as found in some birds, and may be mistaken for indications of capacity.

"The pelvic bones (and there is great contention as to whether they should be very fine or not) we have found to vary in thickness or fineness, showing no particular uniformity in this respect, but always pliable in the good producer. The thickness of bone may be anything from one-sixteenth to five-sixteenths of an inch; the pliability is likely to increase with production. In the indifferent producer it is rigid with no springiness even in the pullet, although its thickness may be the same as the good producer. The shape of the pelvic bone is also important; it should curve gracefully toward the vent with no evidence of being hooked at the points. Width between the points of the pelvic bones, and again depth from there to point of breast bone, is important. This varies, of course, in the pullet about to lay, and excessive measurements cannot be expected, but there must be indications of reasonable measurements between these points, such as 1½ to 2 fingers width between points of pelvic bones and 2½ to 3 fingers width between pelvic bones and point of breast bone.

"When testing these sections with the hand, the good producer will give evidence of a springiness of frame expanding with ease to the touch of the hand.

"The texture of abdominal skin is another sound indication of laying qualities, showing fineness and elasticity, with no tendency to coarseness. This quality is found to increase with production, and is always present even during the bird's period of rest while moulting. I have not yet handled a hen with a coarse, unelastic abdominal skin which could be accused of putting up a good laying record.

"We have come to the foregoing conclusions from actual tests carried out as stated above. It is felt that it would be superfluous to deal with the necessity of evidence of health, vigour, and constitution in the high producer, as this essential should be understood sufficiently well.

"We have followed in our selection of stock annually the lines indicated with a marked degree of success. All birds used in these tests are line bred. It is surprising how little change is to be found in the description taken at the commencement and the one taken at the end of the test, the only marked difference being that of the greater width between points of pelvic bones and depth between those and point of breast bone; also, as above stated, an increased fineness in texture of abdominal skin. Several of our test birds each year, among the light breeds, show a marked growth of spurs almost like a male bird, toward the end of the test.

"There is one other item which may be of interest, although not bearing on the subject; it is usually accepted that the dual-purpose breeds of poultry are superior for winter egg production. Our altitude is 4,100 ft. above sea-level, our winter is extremely dry, but cold and inclined to be windy, yet the White Leghorns prove infinitely superior winter layers to any of the dual-purpose breeds, and yet these breeds appear to stand the extreme heat of summer better than the light breeds."

SETTING EGGS.

If you are using an incubator, set only eggs that you would consider the best shape and size for the breed, carefully follow the instructions of the manufacturer, and use only a machine that has a good reputation. Usually a cheap machine is dear at any price.

The best place to run an incubator is in the cellar where there is fairly good ventilation. A little moisture in the atmosphere is an advantage, and the steady temperature makes the location far more desirable than in a room in the house.

If the machine is of a reliable make, and good fertile eggs are used, with an accurate thermometer registering 102½ degrees at the level of the top of the eggs without too much variation throughout the incubating period of 21 days, you should secure a hatch equal in number and condition of chicks to any that you might get under natural conditions with hens incubating a like number of eggs.

When oil lamps are burned without cessation for long periods, as they are with incubators, there is always an element of danger, unless proper precautions are taken. Only the best grade of oil should be used and the wick and burner kept scrupulously clean.

A little moisture is supplied to the egg chamber in the most convenient manner by the use of moist sand in a tray under the eggs. It can be withdrawn if the moisture is excessive, and returned to the machine if the air cell in the egg shows signs of too rapid evaporation. It is safe to say that more hatches are spoiled through lack of moisture than otherwise, but it is possible to err in either direction. Ability to recognise moisture conditions and requirements will be attained only with experience.

The success or failure of your whole year's work may depend upon your efforts in the incubation season. Whether you hatch by incubator or by hen, April is the month that gives best results.

For a hen, use a nest that can be kept closed except when the hen is off to feed. Test out the eggs on the seventh day. In the early season this sometimes makes it possible to put all the fertile eggs of two settings under one hen and reset the other, thus saving valuable time.

Prepare the setting nest with care, clean and spray, and, when dry, place a moist sod, that has been shaped to fit and hollowed a little in the centre, in the bottom of the nest box. Cover with a layer of fine hay. Dust the hen with flowers of sulphur or other reliable lice killer, and set on eggs that are normal in size and shape for the breed. Keep whole corn, grit, and clean water within easy reach, and see that she is off once a day and returns to her nest promptly in cool weather.

At the first sign of pipping, close up the nest after making sure that the hen has a full crop and a drink, and leave her alone till the hatch is complete. Remove shells and unhatched eggs, and allow her to remain on the nest with the chicks until showing signs of uneasiness. Remove to a clean, well-disinfected coop with clean, sanded floor.

SUGAR: FIELD REPORTS.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Southern Field Assistant, Mr. J. C. Murray:—

"During the month the cane-growing areas of Maryborough, Pialba, Yerra and Childers have been visited.

"*Maryborough.*—Very dry weather has considerably retarded the growth of cane at this place. The canes are presenting a wilted appearance, and if the drought continues some of the cane will be too far gone to successfully ratoon. However, there is still a chance of a fair crushing. The varieties holding out and showing greater hardihood than others are M.1900, D.1135, and Striped Singapore. No disease is in evidence, nor is damage being done by insect parasites. Efforts should be made by the growers to obtain a greater range of cane varieties, also to do more local experimenting with chemical fertilisers and, most important of all, to cultivate thoroughly and to continue to cultivate, until it is impossible to get into the cane. It is only by intensive cultivation of these soils, combined with the introducing of as much vegetable matter and animal manure as possible, that the successive dry stages can, in a measure, be combated.

"On much of this Mary River country, lighter ploughs than those generally in use could be utilised. This would mean a saving of horses, greater pace, and consequently finer tillage. The use of the disc harrow would in some cases be of a decided advantage. All these measures tend to give the soil better texture.

"*Pialba.*—This area is looking very dry, but the cane appears to be in good condition. No disease is causing deterioration, and insect parasites have, so far, not attracted the farmer's attention. A visit was made while at Pialba to Takura, where there are a number of growers. The farmers' prospects in this locality were very fine until the dry spell started. The cane, however, did not wilt rapidly, probably owing to good previous cultivation and maintaining of the sweetness of the soil by efficient drainage. Good drainage is of the utmost importance in cane cultivation. Plant roots must have air, and this is impossible if they are resting in water.

"Some of the growers at Takura have considerable areas of cane under cultivation and deserve to make progress. Pulverised limestone has been used in places, but the results are negative. The reaction of the soil is, on an average, slightly alkaline. Green maize could be ploughed under to advantage as a means of supplying humus.

"Varieties doing best are 1900 Seedling and Demerara 1135. Q.813 should do well here; also Black Innis and H.Q.285. Growers are advised not to cut the 1900 Seedling too early.

"*Yerra.*—This area is not suffering so badly from the lack of rain. This may be on account of the heavy scrubs and forest that abound, which make for more humid conditions, even where rain does not actually fall. The farmers, too, are cultivating well, realising that this is the essence of farming under dry conditions. Much good land still remains to be opened up round Yerra, and better roads are absolutely essential if the people are to have comfortable access to their railways and markets. The unnecessary destruction of timber is to be discouraged in these parts. Trees and scrubs contribute to the rainfall, and settlers and timber-getters should keep this in view.

"Regarding varieties on that part of Yerra which was inspected, Striped Singapore is making easily the best showing. This cane is exhibiting great hardihood and displaying all the characteristics which commend a variety to the farmer. To keep Striped Singapore in this condition, care should be exercised in plant selection, as the cane is generally considered susceptible to the disease known as gumming. 1900 Seedling and D.1135 are making a fair showing, especially the former.

"The farms in the Yerra district are not as accessible to the plough as on most cane growing areas; consequently it is rather surprising the farmers have done the cultivation they have.

"*Childers.*—This important sugar centre is demonstrating at present the vicissitudes of the cane-farmer. Three months ago a great crop was in view, but subsequent dry weather will reduce the original estimate many thousands of tons. Much of the cane is still green, especially the 1900 Seedling, but the yellow appearance indicating the effect of drought is beginning to show in most fields.

"Everything possible in the way of good cultivation has been done by the farmers, and if the rain fell immediately there would still be a good season, owing to the rapid response of the Childers soils to good weather conditions. This would apply especially to the 1900 Seedling and other varieties which are usually cut about mid-spring. The growers are advised to concentrate on getting greater supplies of Q.813 for planting, and also early maturing varieties, such as Black Innis and H.Q.285, preferably the latter. Very little fertilising is being done at present owing to the dry weather. There is no dearth of water in the drains and creeks, all of which are running strongly.

"*Dallarnil.*—There is not a great deal of cane grown here, but a very fine sample of this product was in evidence at Mr. Hambleton's farm. The variety was Striped Singapore, and, considering the stretch of dry weather, has done remarkably well. The soil round Dallarnil is, on an average, a fairly rich loam, and with anything like an average rainfall it should produce good cane. Other varieties doing well at Dallarnil are M.1900 Seedling, Hybrid No. 1, and Q.1098. Mr. Brookfield has the two latter growing on his place; also Shahjahanpur No. 10 and Q.970. These two canes, however, are not doing very well. The Hybrid No. 1 is a good cane, and is worth looking after. This farmer obtained these canes from the Sugar Experiment Station at Bundaberg some two years ago, and they would probably have all grown well only for the drought.

"*Booyal.*—There is some good land in this district under cane, but the dry weather will considerably reduce the original estimate. This is disappointing for the grower, as several have put in much hard work on their properties planting cane. However, the district is holding its own with the other areas under review, and cane-planting is justified here with normal rains. The best variety appears to to Striped Singapore. D.1135 and 1900 Seedling are also making a fair showing."

SHOW DATES 1922 AND 1923.

Show society secretaries are invited to forward for insertion in this list dates of forthcoming shows. Alterations of dates should be notified without delay.

Gayndah: 4th, 5th, and 6th July.
Nambour: 5th and 6th July.
Townsville: 5th and 6th July.
Charters Towers: 11th and 12th July, 1922.
Gatton: 12th and 13th July.
Proserpine: 13th, 14th, and 15th July.
Rosewood: 19th and 20th July.
Caboolture: 20th and 21st July.
Mount Gravatt: 22nd July.
Barcaldine: 25th and 26th July.
Crow's Nest: 26th July.
Pine Rivers: 28th and 29th July.
Wellington Point: 29th July.

Sandgate: 4th and 5th August.
Royal National: 7th to 12th August.
Belmont: 19th August.
Coorparoo: 26th August.
Kenilworth: 31st August.

Beenleigh: 1st and 2nd September.
Zillmere: 1st and 2nd September.
Gympie: 7th, 8th, and 9th September.
Wynnum: 9th September.
Imbil: 13th and 14th September.
Laidley: 13th and 14th September.
Sherwood: 16th September.
Rocklea: 23rd September.
Kilcoy: 28th and 29th September.

Esk Camp Drafting: 4th and 5th October.
Pomona, 4th and 5th October.
Southport: 6th October.
Enoggera: 7th October.

WARWICK.—Eastern Downs Horticultural and Agricultural Association: 13th, 14th, and 15th February, 1923.

GENERAL NOTES.

A Possible New Industry: "Shammy," or Oil Leather.

We frequently receive from men on the land requests for information as to the tanning of opossum and calf skins. The following method of converting skins into the soft so-called "shammy" leather may be of interest to them. Shammy, we may say, is a corruption of the pronunciation of the Swiss-French name of the small deer, the chamois, because it was first produced from the skin of the chamois. The process is thus described by the "Agricultural News," Barbados:—

"The large consumption of imported shammy leathers in the West Indies for motor-car, carriage, and other cleaning purposes, the large export of raw goat and sheep skins to America, and the ease with which goat and sheep can be raised, especially in the Northern Islands, have amongst other considerations suggested the idea that shammy leather making might well form a suitable minor industry for the West Indies.

"In accordance with this idea, the following notes have been prepared for the benefit of those readers who may care to carry out experiments:—

"Shammy leather manufacture is the oldest system of leather-making; but well-shammied leather requires the exercise of much care and numerous manipulative processes. These processes are partly mechanical, partly chemical, and partly bacterial; and although the following describes these processes in a general way, it is likely that they may need modification under tropical conditions such as obtain in the West Indies. The information given is only intended as a guide to the way shammy leather is made, on a small scale, in England and France.

"1. *Skins.*—Sheep skins are chiefly used, but goat and other skins are also employed.

"2. *Soaking.*—Only dried skins need to be soaked.

"3. *Unhairing.*—Soak in slaked lime solution for several days (6 lb. of burnt lime to 100 gal. of water—rain water is best). Add ¼ per cent. sodium sulphide on the weight of the skins as a sharpener. This will reduce the time required for immersion.

"4. *Splitting.*—The skins are split after the completion of the liming process, and the loose and fatty middle layer is removed by a sharp knife, stretching the skin on a convex plank if possible.

"5. *Drenching.*—Part of the lime is then removed by 'drenching.' The skins are put in an infusion (4 parts of bran to 1,000 parts of water). When the skins become white and soft and retain the impression made when probed with the finger, the process is finished.

"The change is brought about by the acids produced in the fermentation of the bran. The drenching process can be brought about much more quickly by a solution strength of 2 lb. of lactic acid in 100 gallons of water, instead of the bran infusion; but the bran infusion is probably much cheaper.

"6. *Removal of Water.*—After draining the skins, as much water is removed as possible by pressing. This allows for the absorption of oil in the next process.

"7. *Oiling.*—This is the essential process. The skins are staked out on a board, fish oil is added, a little at a time but evenly, and the skins are hammered severely with a heavy mallet. (A machine called 'a fuller stock' is used on a large scale.)

"8. *Drying.*—As soon as the skins are saturated with oil, they are hung up dry; but do not let a skin dry until it has properly and evenly absorbed its oil.

"9. It may be necessary to repeat 7.

"10. *Heating.*—Next heat the skins in a stove. This causes some of the oil to oxidise. Though the skins must be heated to a fairly high temperature, care must be taken not to let them burn. As soon as they turn yellow and give off a peculiar odour, not like fish oil, the process is complete. Lay out the skins to cool.

"11. It may be necessary or better to give the skins a little extra natural heating by packing them in a box and letting them sweat.

"12. *Washing.*—The skins, after cooling, are dipped in water and then wrung or hydraulically pressed. They are then ready for use."

Spotted Wilt of Tomatoes.

Tomato plants infested with the spotted wilt disease have been under observation in the suburban gardens (Sydney) throughout the winter, to decide whether or not the disease winters on the old plants. One old vine still alive is at present (11th July) showing the typical symptoms of wilt—*i.e.*, the brownish appearance of the leaves and of the young shoots. As some growers had already commenced (March) to plant out young seedlings, the possibility of their being infected from old vines is apparent. While the exact method of transmission of the disease from plant to plant is unknown, it would be wise for growers to destroy all old vines by burning before commencing to raise early seedlings.—"Agricultural Gazette of New South Wales."

Australasian Association for the Advancement of Science.

We have received from the hon. secretary of the Agricultural Section of the Australasian Association for the Advancement of Science, Mr. B. C. Aston, the following notice of the meeting of the Association to be held at Wellington, New Zealand, in January next:—

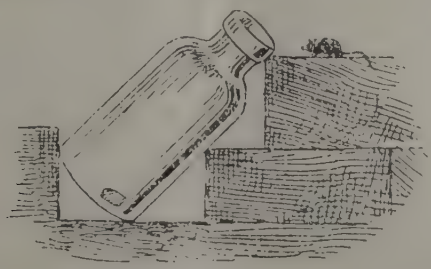
The Wellington meeting of this Association will be held in January next. This will be the third time that the Australasian Association for the Advancement of Science has met in New Zealand, previous meetings having been held in Dunedin and Christchurch.

It is desired to make the Agricultural and Veterinary Sections outstanding features of the meeting, and owing to the comparatively large number of professional agricultural officers employed by the Government and various institutions in New Zealand, compared with other States of the Empire, it is anticipated that the programme of these Sections will be filled to the utmost limit.

The Session of the Association is fixed to begin on 9th January, 1923, but authors of papers which they desire to read or have read at the meeting should send in the titles as soon as possible to the hon. secretary in order that suitable arrangements may be made to ensure a proper treatment for each contribution. It is only desired that the titles of papers should be sent in at first, but the whole of each paper, with an abstract prepared by the authors, should be in the hands of the section honorary secretary not later than 27th January, 1922.

A Useful Mouse-trap.

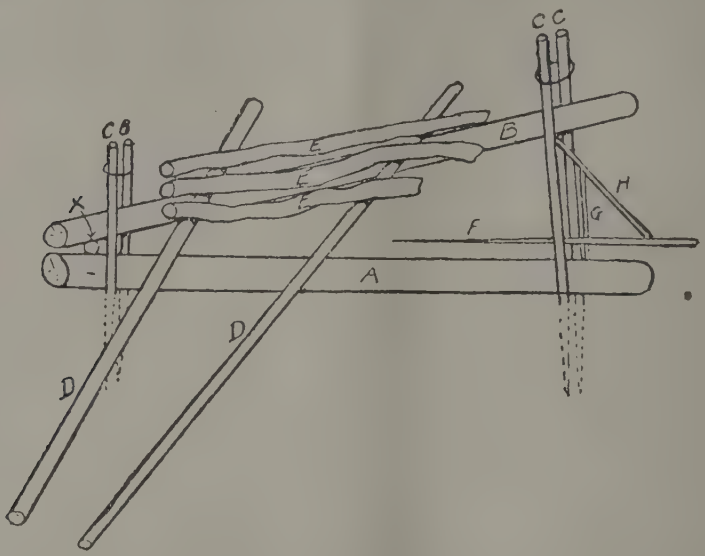
Mice are easily caught if one goes the *right* way about effecting their extermination. A cat is useful in this work, but she cannot eat more than her fill. A dog is too active to watch and wait like his feline companion. Traps want constant attention, and, moreover, they become recognised by the wilier members of these pestiferous vermin. Poison is dangerous; besides which, mice destroyed in this way often die in the runs, and so give rise to offensive odours. Bottles will catch mice alive or dead, as may be required. These bottles should be vessels with fairly open mouths, and not too-long necks, and, when in position, should be placed at an angle, as in the accompanying diagram, with means of approach.



If something is inserted as a bait, with a scent sufficient to attract the attention of the little animals, they will soon investigate the inner recesses of the bottle, and, once there, their exit is more than they can effect themselves. The glass affords no foothold, and although they may spring as far as the bottle neck, down they slide, to repeat the effort until exhaustion compels them to desist. If a poisoned bait is put into the bottle, the traps should be constantly visited, and the bodies of the victims emptied out. Barns, corn-lofts, stacks, and other places about the farm can be cleared pretty effectually of rats and mice by this means; only in the case of rats the bait should always be poisoned.

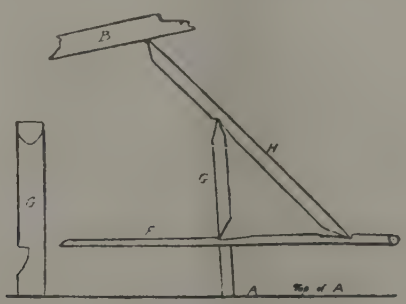
The Russian Wolf-trap.

A trap which is commonly used in Russia for catching wolves and foxes is very simple in its construction, as will be seen by the accompanying illustration, and effective in its work.



To construct it firmly lay on the ground the bedpiece marked A. Then proceed to place the four stakes, which must be pointed to drive into the ground, to keep the fallpiece marked B in position. Lay B on A with a piece of timber the size of the wrist, as shown at X (Fig. 1). Then secure the tops of the stakes CCCC with either rope or wire which has no smell about it. Now lay on the two bearers DD to hold the loading marked EEE. Provide this loading, and you are prepared to set the trap.

The trigger is the next consideration. It is simple and easy to construct with a pocket knife out of a branch the thickness of a whipstick and with the bark left on to make it less conspicuous. FGH is the trigger in three pieces. Determine the intended height of the trap between A and B at the position of the trigger-post G, and let it (the post) be three-quarters of the height. Let H be the strongest piece, as it has to bear the weight of the loading. The piece F is the slightest,



TRIGGER.

with the stouter end to the right hand of the trap, as shown in Fig. 1. In preparing the trigger see sketch No. 2 enlarged, and mate the pieces in proportion, as shown in Sketch No. 1, and it will be evident that the slightest pressure on F is sufficient to disengage it at the catch 1, when the B with its loading collapse on to the intruder—wolf, dingo, wallaby, or fox.

Sometimes the traps may be neglected for a time, and dead vermin allowed to lie in them till they decompose. In this case, do not reset the traps immediately, but put a prop under the fallpiece to keep it up, and bury the trigger pieces for a week to sweeten them, so that the vermin may accustom themselves to the track again.

In placing the trap in position, it should be arranged so that the part F on the trigger comes in the centre of the track or hole in any fence, and the load-bearers DD should be so arranged as not to come in contact with any obstruction when they fall on the vermin, or the latter may effect their escape.

The loading may be made as heavy as circumstances seem to require.

If logs are scarce in some parts of our plain country, a flat-shaped boulder may be fixed up to give weight. The trigger, or acting portion of the trap, is on the principle of the old-fashioned figure-of-four trap which was used for trapping mice and birds in gardens; and keep them down they did, for a large flat stone was used for the purpose. This Russian trap is well worth a trial in Queensland where dingoes are numerous, as it costs nothing but the slight labour needed for its construction.

The Dingo Pest.

Mr. Howard Skinner, Beardie Lagoon, Dirranbandi, in a letter written to the Department of Agriculture and Stock, asks for information concerning any reliable decoy that will induce dingoes to enter traps. The matter was referred to Mr. E. M. Land, M.L.A., who, in reply, said that several methods for the destruction of dingoes are employed, the principal of which are:—

(*a*) Poison baits;
(*b*) Traps;
(*c*) Hunting dogs, such as wolf and stag hounds;
(*d*) Skilled men who know the habits and haunts of the dogs.

Poison baits account for the destruction of the great majority of dogs, and the process adopted for making baits is to secure about an ounce of meat, raw or cooked, great care being exercised that the naked hand does not touch the meat. A slit is made, and as much strychnine as would cover a three-penny bit inserted. A man could make hundreds of these baits in a day. They would then be distributed in likely places. A roasted leg of mutton dragged along, and baits dropped on the trail, have accounted for fourteen dogs on one line of baits in a couple of days, and, at the same time, numbers have died in the bulga scrub. Traps are useful if a path along which the dogs run is known. Care must be taken in handling the traps; otherwise the scent from the hands would be noticed by the dog. The trap should be operated so that the plate on which the lure is laid would be flush with the surface.

ANSWERS TO CORRESPONDENTS.

Airedale Terriers.

By the courtesy of Mr. J. Bain, Secretary of the Royal National Agricultural and Industrial Association of Queensland, we have obtained the addresses of the following reliable breeders of Airedale Terriers:—

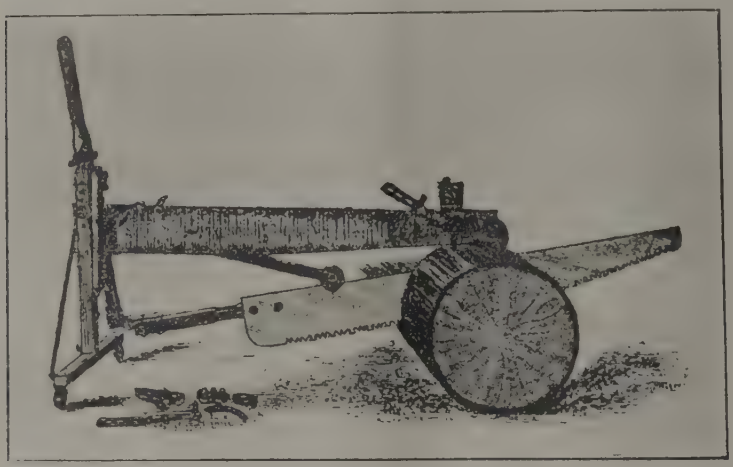
J. Flynn, Surrey street, Red Hill, Brisbane.
R. Smith, Baroona road, Rosalie.
A. Ovenden, Tribune street, South Brisbane.

Re a Folding Saw.

RICHARD S. HEAPE (Buderim Mountain).—

We regret that, so far, we have no information concerning the folding saw illustrated in this Journal in November, 1899. At that time Messrs. James McEwan and Co., Elizabeth street, Melbourne, were makers and agents for the machine. Herewith we furnish the only illustration of it we have seen. It was claimed that any man accustomed to the machine can take it from his shoulder, unfold it, arrange it for sawing down a tree, change it back for sawing off a log, and change it again for sawing on a hillside. It was warranted to stand steady and work on any ground where two men can stand to run a crosscut saw, and to saw any kind of timber from 1 inch to 5½ feet in diameter. No matter how rough the ground may be, or at what angle the log may lie—say, at an angle of 45 deg. one way, and the ground where the machine is to be set the same degree (45) the other way—the machine can be adjusted instantly to suit the ground, log,

and direction desired to saw, without a moment's time being lost in setting the machine. Only one man is needed to run it. We may state that we obtained our information from the "Town and Country Journal."



REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, MAY, 1922.

The weather during the month was very unfavourable for egg production, owing to the cold westerly winds. There were odd cases of broodiness amongst the heavy breeds, also a good many birds moulting, including four in one pen. There were a few cases of sickness and four deaths. These birds have been replaced. Green feed is very scarce, otherwise the feeding of the birds is all that can be desired. The following are the individual records:—

Competitors.	Breed.	May.	Total.
LIGHT BREEDS.			
*W. and G. W. Hindes	White Leghorns ...	89	296
*Bathurst Poultry Farm	Do.	82	280
*N. A. Singer	Do.	93	263
C. H. Singer	Do.	76	245
J. H. Jones	Do.	38	237
*Geo. Trapp	Do.	36	234
A. G. C. Wenck	Do.	59	234
*W. A. Wilson	Do.	58	226
*T. Fanning	Do.	78	223
*W. Becker	Do.	80	218
*Mrs. L. Andersen	Do.	67	216
*S. L. Grenier	Do.	38	213
J. Purnell	Do.	45	210
B. Hawkins	Do.	23	206
*O. Goos	Do.	44	205
*G. Williams	Do.	44	201
*H. Fraser	Do.	46	195
*J. W. Newton	Do.	52	194
*H. P. Clarke	Do.	50	189
*J. M. Manson	Do.	79	189

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	May.	Total.
LIGHT BREEDS—*continued.*			
*Mrs. E. White	White Leghorns ...	38	185
*R. Gill	Do.	70	179
E. Stephenson	Do.	33	179
A. Maslin	Do.	22	179
T. H. Craig	Do.	37	177
*R. C. Cole	Do.	45	176
*C. Goos	Do.	57	174
B. C. Bartlem	Do.	14	164
G. H. Richardson	Do.	36	162
N. J. Nairn	Do.	26	147
*E. A. Smith	Do.	59	147
*Oakleigh Poultry Farm	Do.	37	145
*F. Birchall	Do.	42	142
*J. W. Short	Do.	42	141
*C. M. Pickering	Do.	31	140
A. Anders	Do.	15	140
*M. F. Newberry	Do.	47	138
*Mrs. R. Hodge	Do.	55	135
E. Seymour	Do.	38	134
*Thos. Taylor	Do.	55	133
*R. C. J. Turner	Do.	28	126
Brampton Poultry Farm	Do.	5	99
H. Trappett	Brown Leghorn	4	72
Parisian Poultry Farm	Do.	1	11
HEAVY BREEDS.			
*A. E. Walters	Black Orpingtons ...	67	280
Wombo Poultry Farm	Do.	42	265
Mrs. A. Kent	Do.	25	249
*R. Holmes	Do.	46	232
*H. M. Chaille	Do.	76	231
*R. Burns	Do.	52	225
J. Hutton	Do.	47	225
*T. Hindley	Do.	94	216
*Rev. A. McAllister	Do.	28	194
*E. F. Dennis	Do.	82	191
Mrs. A. E. Gallagher	Do.	57	174
Mrs. L. Maund	Do.	35	153
*Jas. Potter	Do.	34	147
*C. C. Dennis	Do.	92	143
Jas. Hitchcock	Do.	15	135
V. J. Rye	Do.	21	130
R. Innes	Do.	21	128
C. Rosenthal	Do.	34	127
A. Rosenthal	Do.	34	127
C. Doan	Do.	39	117
H. B. Stephens	Do.	40	116
W. C. Trapp	Do.	27	74
W. Becker	Chinese Langshans ...	40	69
*Parisian Poultry Farm	Black Orpingtons ...	20	69
*J. E. Smith	Plymouth Rocks ...	13	24
R. Burns	Silver-laced Wyandottes	2	21
*Miss L. Hart	Rhode Island Reds ...	0	1
Total	...	3,063	11,836

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS.							
W. and G. W. Hindes	64	38	56	48	55	35	296
Bathurst Poultry Farm	40	31	52	54	66	37	280
N. A. Singer	33	52	41	45	40	52	263
G. Trapp	48	25	40	46	39	36	234
W. A. Wilson	32	30	29	51	37	47	226
T. Fanning	18	57	37	43	59	9	223
W. Becker	35	17	53	30	31	52	218
Mrs. L. Andersen	49	20	40	39	31	37	216
S. L. Grenier	35	16	42	40	39	41	213
O. Goos	34	23	35	50	38	25	205
G. Williams	29	38	39	32	29	34	201
H. Fraser	34	44	31	33	22	31	195
J. W. Newton	50	45	33	17	35	14	194
H. P. Clarke	36	18	32	36	37	30	189
J. M. Manson	37	20	37	12	48	35	189
Mrs. E. White	39	11	28	28	42	37	185
R. Gill	35	35	40	22	14	33	179
R. C. Cole	35	38	44	5	29	25	176
C. Goos	19	21	17	32	45	40	174
E. A. Smith	39	16	38	29	9	16	147
Oakleigh Poultry Farm	32	13	24	30	11	35	145
F. Birchall	24	24	7	28	31	28	142
J. W. Short	28	25	29	24	6	29	141
C. M. Pickering	36	35	12	20	22	15	140
M. F. Newberry	23	3	21	51	12	28	138
Mrs. R. Hodge	45	0	18	21	31	20	135
Thos. Taylor	34	8	31	25	24	11	133
R. C. J. Turner	22	14	30	29	24	7	126
HEAVY BREEDS.							
A. E. Walters	42	43	59	36	49	51	280
R. Holmes	27	54	35	37	36	43	232
R. Burns	31	46	23	45	39	41	225
H. M. Chaille	56	35	44	42	37	17	231
T. Hindley	23	42	6	65	67	13	216
Rev. A. McAllister	34	40	55	19	9	37	194
E. F. Dennis	40	27	50	2	28	44	191
J. Potter	17	24	42	23	31	10	147
C. C. Dennis	26	35	32	11	27	12	143
Parisian Poultry Farm	2	11	27	6	12	11	69
J. E. Smith	0	2	7	0	11	4	24
Miss L. Hart	0	0	1	0	0	0	1

CUTHBERT POTTS,
Principal.

CERTIFICATES OF SOUNDNESS.

Certificates of Soundness were issued for the following Stallions during the month of June, 1922:—

Name of Stallion.	Breed.	Period for which Certificate was issued.	Owner's Name.	Owner's Address.
Sir William ..	Draught	Life ..	W. Holland ..	Braemar, Bundaberg
Patalster ..	Blood	Life ..	W. R. Bowman	Solicitor, Brisbane
Attaboy ..	Pony	Life ..	J. Healy ..	Maryborough street, Bundaberg
Don Car ..	Trotter	Life ..	G. Higgs ..	Toogoolawah
Tinta	Coacher	12 months	J. Leiper ..	Avondale

Farm and Garden Notes for August.

Land which has been lying fallow in readiness for early spring sowing should now be receiving its final cultivation prior to seeding operations. Potato-planting will be in full swing this month, and in connection with this crop the prevention of fungoid diseases calls for special attention. Seed potatoes, if possible, should be selected from localities which are free from disease; they should be well sprouted, and, if possible, should not exceed 2 oz. in weight. Seed potatoes of this size are more economical to use than those large enough to necessitate cutting. If, however, none but large-sized seed are procurable, the tubers should be cut so that at least two well developed eyes are left. The cut surfaces require to be well dusted with slacked lime, or wood ashes, as soon as possible after cutting. Where it is necessary to take action to prevent possible infection by fungoid disease, the dipping of potatoes in a solution of 1 pint of 40 per cent. formalin to 15 gallons of water, and immersing for one hour, will be found effective. Bags intended for the subsequent conveyance of tubers to the paddock should also be treated and thoroughly dried. After dipping, spread out the potatoes and thoroughly dry them before re-bagging. Where the tubers are cut, the dipping is, of course, carried out prior to cutting.

Arrowroot, yams, ginger, and sugar-cane may be planted this month in localities where all danger from frosts is over.

Maize may be sown as a catch crop, providing, of course, that sufficient soil moisture is available.

Sweet-potato cuttings may also be planted out towards the end of the month.

Weeds will now begin to assert themselves with the advent of warmer weather; consequently cultivators and harrows should be kept going to keep down weed growths in growing crops and on land lying fallow, as well as on that in course of preparation for such crops as sorghums, millets, or panicums, maize, and summer-growing crops generally.

Tobacco seed may be sown on previously burnt and well prepared seed-beds.

Kitchen Garden.—Nearly all spring and summer crops can now be planted. Here is a list of seeds and roots to be sown which will keep the market gardeners busy for some time: Carrots, parsnip, turnip, beet, lettuce, endive, salsify, radish, rhubarb, asparagus, Jerusalem artichoke, French beans, runner beans of all kinds, peas, parsley, tomato, egg-plant, sea-kale, cucumber, melon, pumpkin, globe artichokes. Set out any cabbage plants and kohl-rabi that are ready. Towards the end of the month plant out tomatoes, melons, cucumbers, &c., which have been raised under cover. Support peas by sticks or wire-netting. Pinch off the tops of broad beans as they come into flower to make the beans set. Plough or dig up old cauliflower and cabbage beds, and let them lie in the rough for a month before replanting, so that the soil may get the benefit of the sun and air. Top dressing, where vegetables have been planted out, with fine stable manure has a most beneficial effect on their growth, as it furnishes a mulch as well as supplies of plant food.

Flower Garden.—All the roses should have been pruned some time ago, but do not forget to look over them occasionally, and encourage them in the way they should go by rubbing off any shoots which tend to grow towards the centre. Where there is a fine young shoot growing in the right direction, cut off the old parent branch which it will replace. If this work is done gradually it will save a great deal of hacking and sawing when next pruning season arrives. Trim and repair the lawns. Plant out antirrhinums (snapdragon), pansies, hollyhocks, verbenas, petunias, &c. Sow zinnias, amaranthus, balsam, chrysanthemum, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins; and plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna, lily, and other bulbs. In the case of dahlias, however, it will be better to place them in some warm, moist spot, where they will start gently and be ready to plant out in a month or two. It must be remembered that this is the driest of our months. During thirty-eight years the average number of rainy days in August was seven, and the mean average rainfall 2.63 in., and for September 2.07 in., increasing gradually to a rainfall of 7.69 in., in February.

Orchard Notes for August.

THE COAST DISTRICTS.

The remarks that have appeared in these notes during the last few months respecting the handling and marketing of citrus fruits apply equally to the present month. The bulk of the fruit, with the exception of the latest ripening varieties in the latest districts, is now fully ripe, and should be marketed as soon as possible, so that the orchards can be got into thorough order for the Spring growth. All heavy pruning should be completed previous to the rise in the sap; and where Winter spraying is required, and has not yet been carried out, no time should be lost in giving the trunks, main branches, and inside of the trees generally a thorough dressing with lime and sulphur wash.

Where citrus trees are showing signs of failing, such as large quantities of dead or badly diseased wood in the head of the tree, they can (provided the root system is healthy (be renovated by cutting back the entire top of the tree till nothing but sound healthy wood is left. This should be thinned out, only sufficient main limbs being left from which to form a well-balanced tree, and the trunk and limbs so left should receive a dressing of lime sulphur, or Bordeaux paste.

Healthy trees that are only producing inferior fruit should be treated in a similar manner, and be either grafted with an approved variety direct or be allowed to throw out new growth, which can be budded in due course. The latter method is to be preferred, and an inferior and unprofitable tree can thus be converted in the course of a couple of years into a profitable tree, producing good fruit.

Where orchards have not already been so treated, they should now be ploughed so as to break up the crust that has been formed on the surface during the gathering of the crop, and to bury all weeds and trash. When ploughed, do not let the soil remain in a rough, lumpy condition, but get it into a fine tilth, so that it is in a good condition to retain moisture for the tree's use during Spring. This is a very important matter, as Spring is our most trying time, and the failure to conserve moisture then means a failure in the fruit crop, to a greater or lesser extent.

Do not be afraid if you cut a number of surface roots when ploughing the orchard, but see that you do cut them, not tear them. Use a disc plough and keep the discs sharp, and the root-pruning the trees will thus receive will do more good than harm, as it will tend to get rid of purely surface roots.

Planting of all kinds of fruit trees can be continued, though the earlier in the month it is completed the better, as it is somewhat late in the season for this work. The preparation of land intended to be planted with pineapples or bananas should be attended to, and I can only reiterate the advice given on many occasions—viz., to spare no expense in preparing the land properly for these crops—as the returns that will be obtained when they come into bearing will handsomely repay the extra initial expense. Growers of pineapples and bananas who send their fruit to the Southern markets should take more care in the grading and packing of such fruit, as their neglect to place it on the market properly means a big difference in price, and entails a loss that could be avoided had the necessary care and attention been given. The same remarks apply to the marketing of citrus fruits, pawpaws, custard apples, strawberries, cucumbers, and tomatoes, all of which are in season during the month.

The pruning of all grape vines should be completed, and new plantings can be made towards the end of the month. Obtain well-matured, healthy cuttings, and plant them in well and deeply worked land, leaving the top bud level with the surface of the ground, instead of leaving 6 or 7 in. of the cutting out of the ground to dry out, as is often done. You only want one strong shoot from your cutting, and from this one shoot you can make any shaped vine required. Just as the buds of the vine begin to swell, but before they burst, all varieties should be dressed with sulphuric acid solution, composed of three-quarters of a pint of commercial sulphuric acid to one gallon of water; or, if preferred, this mixture can be used instead—viz., dissolve 5 lb. of sulphate of iron (pure copperas) in one gallon of water, and when dissolved add to it half a pint of sulphuric acid. This is the winter treatment for the prevention of anthracnose or black spot, and for downy mildew, and should on no account be neglected.

Fruit-fly will make its appearance during the month, and citrus and other fruits are likely to be attacked. Every grower should, therefore, do his best to destroy as many flies as possible, both mature insects and larvæ, the former by trapping or otherwise, and the latter by gathering and destroying all infested fruit. If this work is carried out properly, a large number of flies that would otherwise breed out will be destroyed, and the rapid increase of the pest be materially lessened. The destruction of fruit-flies early in the season is the surest way of checking this serious pest.

Keep a careful lookout for orange-sucking bugs, and destroy every mature or immature insect or egg that is seen. If this work is done thoroughly by all citrus growers there will be far fewer bugs to deal with later on, and the damage caused by this pest will be materially reduced. Destroy all elephant beetles seen on young citrus trees, and see that the stems and main forks of the trees are painted with a strong solution of lime sulphur.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The pruning of all deciduous trees should be finished during the month, and all such trees should be given their annual winter spraying with lime sulphur. The planting of new orchards should, if possible, be completed, as it is not advisable to delay. Later planting can be done in the Granite Belt, but even there earlier planting is to be preferred.

Peach trees, the tops of which have outlived their usefulness and of which the roots are still sound, should be cut hard back so as to produce a new top which will yield a good crop of good fruit the following season in from fifteen to eighteen months, according to the variety.

Apple, pear, or plum trees that it is desirable to work over with more suitable varieties should also be cut hard back and grafted. All almond, peach, nectarine, and Japanese plum trees should be carefully examined for black peach aphis, as, if the insects which have survived the Winter are systematically destroyed, the damage that usually takes place from the ravages of this pest later on will be materially lessened.

Woolly aphis should also be systematically fought wherever present. The best all-round remedy for these two pests is spraying with black leaf 40.

In the warmer parts of these districts the pruning of grape vines should be completed, and they should receive their Winter dressing for black spot and downy mildew, as recommended for the Coast. In the Granite Belt the pruning of vines should, however, be delayed to as late in the season as possible, so as to keep the growth back and thus endeavour to escape late Spring pests.

Where orchards and vineyards have been pruned and sprayed, the land should be ploughed and brought into a state of as nearly perfect tilth as possible, so as to retain the moisture necessary for the proper development of the trees or vines and the setting of their fruit.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1922.	JULY.		AUGUST.		SEPTEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	6·45	5·6	6·36	5·20	6·7	5·37
2	6·45	5·6	6·35	5·21	6·6	5·38
3	6·45	5·7	6·35	5·21	6·5	5·38
4	6·45	5·7	6·34	5·22	6·4	5·38
5	6·45	5·8	6·33	5·23	6·3	5·39
6	6·45	5·8	6·32	5·24	6·2	5·39
7	6·45	5·9	6·31	5·24	6·1	5·40
8	6·45	5·9	6·30	5·25	6·0	5·40
9	6·44	5·10	6·29	5·26	5·58	5·41
10	6·44	5·10	5·28	5·27	5·57	5·41
11	6·44	5·10	6·28	5·28	5·56	5·42
12	6·44	5·11	6·27	5·28	5·55	5·42
13	6·43	5·11	6·26	5·29	5·53	5·43
14	6·43	5·12	6·25	5·29	5·52	5·44
15	6·43	5·12	6·24	5·30	5·51	5·45
16	6·42	5·13	6·23	5·30	5·50	5·45
17	6·42	5·13	6·22	5·31	5·49	5·46
18	6·42	5·14	6·21	5·31	5·48	5·46
19	6·41	5·14	6·21	5·32	5·47	5·46
20	6·41	5·15	6·20	5·32	5·46	5·46
21	6·41	5·15	6·19	5·32	5·44	5·46
22	6·40	5·16	6·18	5·33	5·43	5·47
23	6·40	5·16	6·17	5·33	5·42	5·47
24	6·39	5·17	6·16	5·34	5·41	5·47
25	6·39	5·17	6·15	5·34	5·40	5·48
26	6·38	5·18	6·14	5·35	5·39	5·48
27	6·38	5·18	6·13	5·35	5·38	5·49
28	6·37	5·19	6·12	5·36	5·37	5·49
29	6·37	5·19	6·11	5·36	5·36	5·50
30	6·36	5·20	6·10	5·37	5·35	5·50
31	6·36	5·20	6·9	5·37	...	...

PHASES OF THE MOON, OCCULTATIONS, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer Time" is not used.

			H. M.
2 July	☾	First Quarter	8 52 a.m.
9 „	○	Full Moon	1 7 p.m.
17 „	☽	Last Quarter	3 11 p.m.
24 „	●	New Moon	10 47 p.m.
31 „	☾	First Quarter	2 22 p.m.

Apogee on the 15th at 3.24 a.m.
Perigee on the 27th at 1.30 a.m.

About 8 o'clock in the evening of 29th July the apparent nearness of the Moon and the giant planet Jupiter low down in the west will form a very interesting spectacle; there will be an occultation of Jupiter about 9 o'clock.

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8 Aug.	○	Full Moon	2 19 a.m.
16 „	☽	Last Quarter	6 46 a.m.
23 „	●	New Moon	6 34 a.m.
29 „	☾	First Quarter	9 55 p.m.

Apogee on the 11th at 6.54 p.m.
Perigee on the 24th at 5.42 a.m.

During the evenings of 14th, 15th, and 16th August the planets Venus and Saturn will, with Eta Virginis, a second magnitude star, form an interesting group in the north-west.

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6 Sept.	○	Full Moon	5 47 p.m.
14 „	☽	Last Quarter	8 20 p.m.
21 „	●	New Moon	2 38 p.m
28 „	☾	First Quarter	8 40 a.m.

Apogee on the 8th at 4.12 a.m.
Perigee on the 21st at 3.36 p.m.

About 3 o'clock on the afternoon of 30th September a pair of binoculars should afford a view of the Moon and a third magnitude star—Beta Capricorni. In the course of an hour the star may be seen in a small telescope to disappear suddenly on the eastern side of the Moon and reappear on its western side.

The planet Venus will be at its greatest height in the western sky on 15th and 16th September.

The Great Australian Solar Eclipse will occur on 21st September between a few minutes after 3 p.m. to about a quarter past 5.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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